# REPORT RESUMES

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TEACHING CRITICAL THINKING IN THE SECONDARY SCHOOL.
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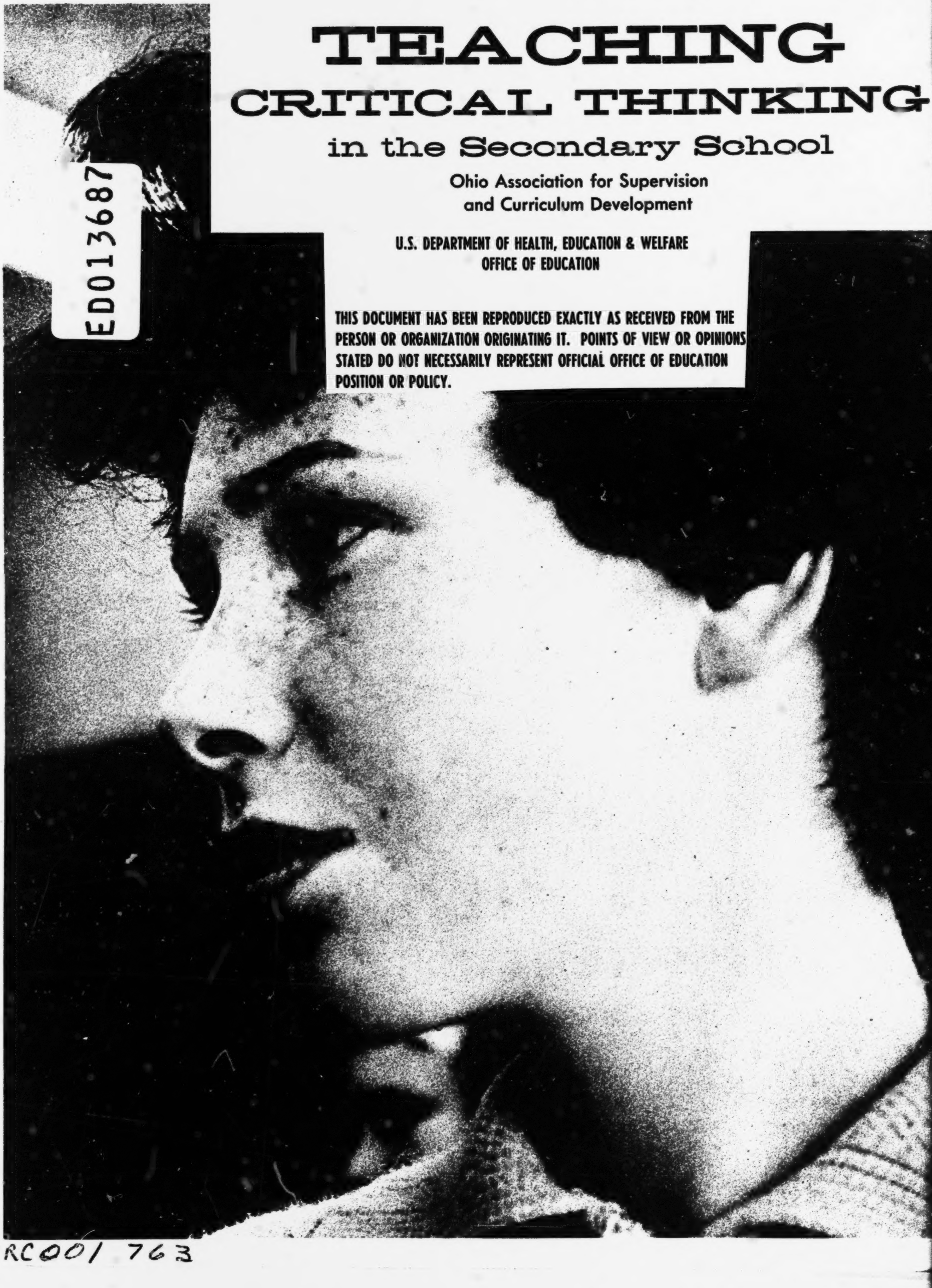
DESCRIPTORS- *CLASSROOM TECHNIQUES, *TEACHING PROCEDURES, *CRITICAL THINKING, *INTELLECTUAL DISCIPLINES, *INSTRUCTIONAL PROGRAM DIVISIONS, TEACHERS, SCHOOLS, PROBLEM SOLVING, ENGLISH, SOCIAL STUDIES, SCIENCES, MATHEMATICS, ART, OHIO ASCD,

IT IS THE EXPRESSED HOPE OF THE AUTHORS THAT THE PRACTICES DESCRIBED HERE WILL STIMULATE READER MODIFICATIONS OF THE MATERIAL PRESENTED, FOR EFFECTIVENESS IN ANY SCHOOL SITUATION. THE BOOK PRESENTS METHODS, PROCEDURES, AND TECHNIQUES FOR TEACHING CRITICAL THINKING IN JUNIOR AND SENIOR HIGH SCHOOL. CRITICAL THINKING AND PROBLEM SOLVING, USED SYNONYMOUSLY, ARE DEFINED AS SUSPENSION OF JUDGEMENT IN PROBLEM SOLUTION. NECESSARY FACTORS CITED IN THE PROCESS ARE--(1) MASTERY OF SUB-SKILLS, (2) CORRECT CLASSROOM CLIMATE, (3) INDEPENDENT STUDY, AND (4) GROUP COOPERATION. INTELLIGENT QUESTIONING IS SEEN AS A PART OF GOOD TEACHING. TO EMPHASIZE THIS CONCEPT SAMPLE QUESTIONS ARE PRESENTED, AIMED TO PROVIDE HELP IN THE FOLLOWING AREAS--(1) SETTING THE STAGE FOR LEARNING, (2) CALLING UP MENTAL IMAGES, (3) CLARIFYING SIGNIFICANT DETAILS, (4) BRINGING OUT THE WHYS, (5) HIGHLIGHTING IMPORTANT IDEAS, AND (6) HELPING STUDENTS CONSOLIDATE IDEAS AND APPLY NEW UNDERSTANDINGS. FURTHER DISCUSSION INCLUDES TEACHER ROLE AND RESPONSIBILITIES IN DEALING WITH CONTROVERSIAL ISSUES, AN OUTLINE OF THE STEPS AND SKILLS IN CRITICAL THINKING, AN OBSERVATION RECORD OF CRITICAL THINKING, RECOMMENDATIONS FOR BRAINSTORMING, AND AN EVALUATION METHOD FOR CRITICAL THINKING. CONSIDERABLE ATTENTION IS DEVOTED TO SPECIFIC TECHNIQUES AND SUGGESTIONS FOR TEACHING CRITICAL THINKING IN THE ENGLISH PROGRAM, THE SOCIAL AND PHYSICAL SCIENCES, MATHEMATICS, AND THE ARTS. A BRIEF BIBLIOGRAPHY IS INCLUDED. (JS)



# TEACHING CRITICAL THINKING in the Secondary School

Ohio Association for Supervision
and Curriculum Development

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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# TEACHING CRITICAL THINKING
# IN THE SECONDARY SCHOOL

OHIO ASSOCIATION OF SUPERVISION AND CURRICULUM DEVELOPMENT
A DEPARTMENT OF THE OHIO EDUCATION ASSOCIATION

1964

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# FOREWORD

Children and youth of today have greater need than at any time in history to learn how to do critical thinking. Knowledge is now doubling every decade. Therefore, school pupils cannot be expected to learn all the information that might be important to learn. Furthermore, because of rapid changes many facts of one period of time are no longer facts a later period of time. With these existing circumstances we must spend more time in our elementary and secondary schools in teaching pupils how to think rather than spending so much time, as we have in the past, in memorizing facts and in rote learning.

In this book we have brought together numerous descriptions of classroom practices and procedures for teaching critical thinking. Most of these descriptions have been written by master teachers from schools in all sections of Ohio. Readers should read these descriptions for the purpose of gathering possible ideas for teaching practices in their schools. Most readers will not be interested in imitating completely, in their teaching, the practices they read. However, the practices described should stimulate the thinking of readers to develop modifications of practices which will be effective in their own local school situations.

This book and its complementing volume Teaching Critical Thinking in the Elementary School represent the first publications that we know of which attempt to provide concrete descriptions for teaching critical thinking in the total curriculum of the elementary and secondary schools. There have been considerable writings for a number of years in which the authors theorized on critical thinking. John Dewey's How We Think, of course, has been a classic on the theory of teaching critical thinking.

We feel that this book and its complement Teaching Critical Thinking in the Elementary School should be very helpful to teachers, supervisors, and principals who are interested in doing a better job of teaching their pupils to do critical thinking.

The concrete examples of practices, methods, procedures, and techniques described in these two books should stimulate other teachers and supervisors to create even better practices than the ones we have here. If these books stimulate more creative ideas to come forth for teaching pupils how to do critical thinking, then the two years of time the Ohio Association of Supervision and Curriculum Development Commission for Instruction and Curriculum has spent on these books has been valuably spent.

We thank the numerous teachers and supervisors who have contributed written descriptions for this book. We regret that we were not able to use many written descriptions which have been contributed for this book because they overlapped with other descriptions our commission chose to use. We also thank the Western New York Study Council at the University of Buffalo for permission to use a number of items from their booklet Critical Thinking Through Language Arts.

All practices provided in this book do not necessarily reflect the thinking of the Ohio Association of Supervision and Curriculum Development. The descriptions were written by individual Ohio teachers and supervisors and the general content of these descriptions was not altered. All contributors of items provided in this book are listed at the end of the book. The Commission for Instruction and Curriculum of the Ohio Association of Supervision and Curriculum Development, which was responsible for supervising the development of this book, is listed on page 4.

Items in this book have been categorized and placed into chapters reflecting the subject departmental areas where they are most appropriately usable. The specific subject and grade where practices have been used are listed with each item. The Introduction Chapter provides an overview treatment on teaching critical thinking which should be helpful to the reader before reading the ensuing chapters.

Lloyd W. Dull, Editor

## CHAPTER 1

# INTRODUCTION

This chapter was written by Lloyd W. Dull, Assistant Superintendent of Curriculum and Instruction in the Canton City Schools and Chairman for the Commission of Curriculum and Instruction for the Ohio Association for Supervision and Curriculum Development which was responsible for the preparation of this publication.

# INTRODUCTION

For the continued progress of our nation and democracy, our citizenry must be knowledgeable and expert in the use of critical thinking. Since the beginning of time, educators have proclaimed that perhaps one of the major goals in the education of children and youth is to teach them to think. "The purpose which runs through and strengthens all other education purposes -- the common thread of education -- is the development of the ability to think." These words are from the Educational Policies Commission report, "The Central Purpose of American Education." This report was circulated in 1961 by the N.E.A. and represents the most up-to-date statement of purposes of American education.

This statement by the Educational Policies Commission does not mean that teaching pupils to think is the sole purpose of education, but it does imply that the development of rational powers in students is a pervasive concern of the school and that such development is essential to the good life of the individual. The realization of human dignity and greatness can be materialized best by the kind of education which frees the mind for thinking.

Writers vary in their terminology when referring to the process of teaching pupils to think. The terms critical thinking, scientific method, problem solving, method of intelligence, reflective thinking, scientific thinking, and inquiry training are most commonly used in the literature to refer to the type of thinking we are describing in this publication. In this book we shall use critical thinking as our chief phrase to denote the various steps covered in a complete act of thought in examining a problem situation and arriving at conclusions, decisions, and actions with an open mind.

In a few situations, we shall use synonymously the phrase of problem solving. It is this writer's point of view and the viewpoint followed in this book that the varied phrases used in the literature, in general, deal with the same process of operation in fulfilling thinking. We define critical thinking in the next topic.

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This Introduction Chapter was written by Dr. Lloyd W. Dull, Assistant Superintendent of Canton City Schools and Chairman of the OASCD Commission for Instruction and Curriculum.

## DEFINITION OF CRITICAL THINKING OR PROBLEM SOLVING

There is no single set of steps that is followed completely in carrying on critical thinking or problem solving. A great deal of research indicates that critical thinking or problem solving behavior is variable from situation to situation and from time to time. A particular problem solver tends to vary his approach and his steps from problem to problem. Although we have these behavior variations, there are certain general basic aspects of the critical thinking or problem solving process which tend to be fairly common.

As a result of a perusal of much of the educational literature bearing on the topic of critical thinking or problem solving, the following sequence of steps is provided:

1. Identify and define a problem.
    a. A well defined problem is clear, definite, limited to scope, and specific in objective.
2. Collect data and information related to the problem.
3. Organize the data and information which applies most permanently to the heart of the problem.
4. Evaluate various solutions in view of the assembled data bearing on the problem and select the best one for the situation.
5. Act upon the solution.
6. Evaluate the action and revise the solution if necessary.

The essence of critical thinking or problem solving is the suspension of judgment in the solution of problems. Snap judgments are not a normal part of critical thinking. The truly critical thinker normally uses many sources to gather data bearing on his problem. Inquiry is vital to critical thinking or problem solving.

As has been mentioned before, the process of critical thinking or problem solving is variable. Therefore, not all the above steps may be used in every problem which an individual tackles. Neither are the listed steps always used in the same order; also, on occasion some steps may be omitted.

# CONTRIBUTIONS OF JOHN DEWEY WHICH HAVE IMPLICATIONS ON TEACHING CRITICAL THINKING[1]

There were contributions made by Dewey on education methodology that have exercised a great influence on what one might consider as characteristics which further the teaching of critical thinking. Therefore, the writer is listing below several contributions to educational thought made by John Dewey which have had implications on teaching critical thinking.

1. Analysis of the Complete Act of Thought
    a. One feels a difficulty or problem that perplexes him.
    b. One attempts to locate and define the problem.
    c. One draws up tentative hypotheses for solving the problem. (The essence of critical thinking is suspended judgment.)
    d. One develops by reasoning the bearings or implications.
    e. Further observation and experiment leads to acceptance or rejection of what seems to be the best hypothesis.

2. Teaching and learning are correlative or corresponding processes. Teaching takes place only when pupils learn. The initiative in learning lies with the learner. One can teach others only in the sense of appealing to and fostering powers already active in them. Effective appeal of this kind is impossible unless the teacher has an insight into existing habits and tendencies, the natural resources with which he has to ally himself.

3. No one understands a general principle fully until he can employ it in the mastery of new situations. Too often the textbook or teacher is contented with a series of somewhat perfunctory examples and illustrations, and the student is not forced to carry the principle that he has formulated into further cases of his own experience. Thus, the principle is inert and dead.

4. Since children are pre-eminently active in their tendencies and like to do things, schools should organize and relate such active pursuits such as manual training, gardening, cooking, weaving, excursions, and various graphic arts so that they will become instruments for forming alert, persistent, and fruitful intellectual habits. If these are used for presenting typical problems to be solved by personal reflection and experimentation, great opportunity will be provided for children to be trained in self-reliance, efficient social service, and in methods of

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[1] Information on points 1-10 on this topic was taken in order from pp. 72-77, 29-30, 99, 168, 185, 191, 199, 204-205, 218 and 82 in How We Think by Dewey and information on points 11-13 was taken in order from pp. 65, 188, and 188 in Democracy and Education by Dewey.

experimental inquiry and proof.

5. Sporadic and fragmentary discourse promoted in recitation teaching has a disintegrating intellectual influence. Teachers tend to monopolize continued discourse. Children are confined to answering questions in brief phrases. Short assignments followed by analytic questioning during the recitation period has the effect to so minutely divide the material as to break up the unity of meaning, to destroy perspective, and in effect to reduce the whole topic to an accumulation of disconnected details all upon the same level.

6. Scientific observations should be linked to problems which students wish to define and solve and they should serve a practical aim. When this is done the facts considered will bear on the practical aim and not just on an isolated problem as such.

7. Materials of the classroom must be linked to what the pupils acquire in their out-of-school experience. When this is done, pupils will not live in two separate worlds, one being the world of out-of-school experience, the other the world of books and lessons.

8. The teacher's problem is not one of mastering a subject-matter, but rather it is one of adjusting a subject-matter to the nurture of thought. With this in mind the teacher should consider the following questions as she plans her school program: What familiar experiences of theirs are available? How shall I present the matter so as to fit economically and effectively into their present equipment? What incidents shall I relate? What comparisons shall I lead them to draw, what similarities to recognize? What is the general principle toward which the whole discussion should point as its conclusion? By what applications shall I try to fix, to clear up, and to make real their grasp of this general principle? What activities of their own may bring it home to them as a genuinely significant principle?

9. Willingness to work for ends by means of acts not naturally attractive is best attained by securing such an appreciation of the value of the end that a sense of its value is transferred to its means of accomplishment. The argument that children should be kept doing drudgery-tasks because they acquire power to be faithful to distasteful duties is wholly fallacious; repulsion, shirking, and evasion are the consequences--not loyal love of duty.

10. Induction moves from fragmentary details or particulars to a connected view of a situation; deduction begins with the latter and works back again to particulars, connecting them and binding them together. School practices should use induction and deduction together and not independently.

11. Educational content and activities should have intrinsic value in meeting and solving the problems of present living as well as those which may be useful in the future. Pupils should be called upon to intellectualize past experience as it relates to present problems and possible future problems.

12. The child thinks only by wrestling with the conditions of a problem first hand, seeking and finding his own way out.

13. The teacher is responsible to provide the conditions which stimulate thinking and for taking a sympathetic attitude toward the activities of the learner by entering into a common or conjoint experience with the child.

## EXPLOSION OF KNOWLEDGE INCREASES NEED FOR TEACHING CRITICAL THINKING

With the explosion of knowledge multiplying at a rate almost beyond previous dreams, there are many national educational leaders who are suggesting that teaching must focus and orient more today on the process of learning. Many of these leaders are stressing the need for a change from convergent teaching (the what, when, and where) to divergent teaching (the how and why). With mountains of knowledge accumulating, the school child of today cannot possibly learn all this knowledge as information as the school child did only a quarter of a century ago.

The teaching of pupils to think is the responsibility of all teachers. Yet, far too many schools fail to give pupils the guidance necessary to do effective thinking. Learning how to think begins in the kindergarten and continues throughout all grades.

## MASTERY OF SUB-SKILLS IMPORTANT

To do effective thinking pupils must be taught to have facility in a constellation of sub-skills which provide a framework for doing thinking. These sub-skills are: (1) background of knowledge; (2) wide meaning vocabulary; (3) language arts skills -- speaking, listening, writing, etc.; (4) visual and auditory perception skills. As a child faces a new problem, he draws upon different sets of subskills and organizes them into a working system for his attack upon the problem. A child who is lacking in these sub-skills is handicapped in doing critical thinking.

In developing critical reading, pupils must be taught to use an inquiring mind. This means that they must be influenced to practice the suspension of judgment. Pupils must become habitual in looking beyond the obvious; they must learn to be skeptical of the too sure, the too simple, and the incomplete. The task of the teacher is to develop alert, active, and discriminating readers, viewers, and listeners.

As pupils become more mature in experience they should become strongly familiar with some of the standard propaganda devices -- for example: glittering generalities and bandwagons.

From the intermediate grades on, pupils will find many sources of information in which there is disagreement. In history books they will find different dates. They will meet adults whom they respect who will offer differing opinions on problems of concern to them; furthermore, these adult opinions may differ again with information they gather in their reading. These experiences provide a rich storehouse of opportunity to teach pupils to be critical readers and critical thinkers.

## CLASSROOM CLIMATE WITH SUFFICIENT FREEDOM

Teachers must assure that there is sufficient freedom in the classroom environment for pupils to seek answers. Pupils must be guaranteed the opportunity to find out. This means pupils must have a free reign to check on facts. This may require an occasional trip on the part of the individual students from the classroom to the library to bring back information to the class. The classroom climate should be such that pupils will not fear censure for mistaken ideas. When pupils have freedom to inquire and to make honest admission of errors they grow in the ability to do critical thinking.

For pupils to become adept as critical thinkers, teachers must emphasize the processes of inquiry, investigation, and discovery over rote learning. Administrators must seek to build libraries that are well-stocked with books and periodicals that represent a wide range of viewpoints. Teachers must have students write essay examinations, compositions, and other forms of written exercises which require students to organize ideas and present them in a logical manner. Teachers, as they work with pupils, must exercise and exhibit an example in their classroom discussions with students of avoiding autocratic dogma, personal prejudice, and preconceived ideas. A good classroom climate will stimulate intellectual curiosity, encourage creativeness, and arouse on the part of pupils a desire for academic excellence.

## FOSTERING OF INDEPENDENT STUDY

The fostering of independent study can be very helpful in promoting critical thinking by students. A technique which the teacher can use here is to permit students to become experts regarding certain topics. For example, a student might become an expert on a certain favorite author. He might do considerable research on the author in order to gain insights and understanding about the author which prompted certain kinds of writing.

To foster independent study, teachers might stress the process of discovery. Here we would be recommending that pupils be given opportunities to learn through discovery.

Recent curricular innovations, particularly in mathematics and science, have been concerned with the most effective way to present subject matter; they have been developed around concepts using the discovery approach in which the student is an independent learner himself. The pupil in the discovery process learns through setting up situations or conditions through which he observes and discovers.

Perhaps the classic example in the history of mankind of the use of the discovery process to learn was the case of Archimedes, the Greek geometrician. He allegedly became so excited about a discovery while taking a bath that he rushed unclothed through the streets of Athens shouting "Eureka!" This classical case certainly illustrates very dramatically the excitement that learning can bring when it is based on discovery.

With the rapid growth of knowledge in today's world, letting students learn through their own Eurekas resulting from independent study may be the technique that can help greatly with the learning problem for pupils. Certainly, we must encourage more effort on the part of the teachers to make use of the methodology of discovery through inquiry as a part of the learning process for both elementary and secondary school pupils. Most pupils find the discovery approach a pleasurable and effective way of learning.

## CRITICAL THINKING BY GROUP PROCESS

In solving group problems, in addition to clarifying the goal, analyzing the problem, and finding a promising solution, there is the factor of resolving conflicts among individuals in the group, and need, therefore, for the group to work cooperatively to get the problem solved. A group, when working toward the solution of a problem, must maintain satisfactory teamwork and a balance of roles and abilities in order to assure the unity and continued effort to proceed together.

For groups to be successful in solving problems, it is important that they comply with generally established criteria for operation which follow:

1. They should take time to get acquainted.

2. They should be informal.

3. They should clarify their purposes, - this means they should establish the role of the chairman, the observer, the recorder or secretary, and of the general members.

4. They should consider who should be represented in their group.

5. There should be an atmosphere of permissiveness so that all members will speak.

6. Proper environmental conditions should be established which might encourage healthy group process work -- chalkboard,paper, tables, comfortable chairs, adequate ventilation and light.

7. They should make fact-finding surveys.

8. They should encourage all discussion to be of a group

ownership type, and it should never be of the personal possessiveness type. This makes possible objective evaluation of an idea without worrying about attacking the person who might have contributed the idea.

9. The group should organize subcommittees to work on subdivisions of the major problems.

When committees are working in a classroom, the teacher needs to move from group to group, observing process, noting pupils who may later need individual help in certain skills, and helping where needed without interfering with committed initiative.

## ASKING GOOD QUESTIONS IS PART OF GOOD TEACHING[2]

In your classroom visiting you've no doubt sat in on lessons in which the teacher's questions made children fairly crackle with ideas; other lesson periods in which only a few sparks sputtered and died.

Considering the kinds of questions that make young minds really start to think can help teachers build more successful lessons in every area of the curriculum.

For what purposes do teachers use questions? Can the questions they ask usually be answered just by a "yes" or "no"? By giving back the words in the book? Or do teachers plan questions that help pupils "see" a situation, clarify details, sort out ideas, make applications?

### Questions to Set the Stage for Learning

Questions can send pupils into a lesson with enthusiasm, ready to explore a new story or topic and eager to find out something that sounds interesting to them. Here are some samples of lesson "starters".

> Have you ever needed to know how long something was when you didn't have a ruler handy? When? . . . Today we are going to learn about ways you can measure things with your eyes.
>
> Why do we need two sets of teeth? Why do second teeth sometimes come in crooked? Let's see if we can find out as we work with the lesson.
>
> Which of the views pictured here might you see in our

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[2] Information on this topic was taken from an article by the same title in School Briefs, an in-service education supplement which was published by the Scott-Foresman Company in 1961. Permission was granted by Scott-Foresman Company to use information from this article.

> state? What interesting facts about our state could you tell a person from another state? As you read this unit, you will discover some of the ways in which the fifty states in our nation are both alike and different.

Obviously, the closer a question can get to the real interests or problems of pupils, the greater its power for motivating good reading and good thinking.

## Questions to Call up Mental Images

Probably our best thinking is done when our minds are clearly visualizing the situations we're reading about or the problems we're trying to solve. Questions can help pupils see pictures and form other types of sensory images whenever they read or put their minds to work on a problem.

> What do you see happening in this part of the story? How does the covered wagon look in the storm? Think about the canvas, the wheels, the driver, the team. How do the people inside the wagon look? What sounds do they hear? How do they feel?
>
> If you were taking a hike through the woods and had on shorts, a shirt, short socks, and sandals -- no hat or cap -- what are some of the things that might happen? What clothes would be better for wear on a hike through the woods?
>
> What pictures does this arithmetic problem make you see? What action is taking place? Can you make an equation to tell what you see?

A teacher might make it a point to ask questions about the images aroused by particular words.

For instance, she might ask pupils to show how a story character looked as he *walked with dragging steps* or *slumped despondently to a chair*; or how he sounded in making a remark that was *gasped*, *confided*, or *offered timidly*. She might also help pupils picture the difference between words of similar meanings by asking questions such as "Can you see the difference between *bend* and *duck*? Between *walk*, *stride*, *and* *stroll*? Can you feel the difference?"

The questions "What does it look like?" "How does it feel?" can start children searching for precise descriptive terms that make word pictures for others to read or listen to.

## Questions to Clarify Significant Details

By asking questions about details that really matter, a teacher discovers and corrects small misunderstandings that could lead to bigger ones. Often such questions sharpen mental images, clarify word meanings, or check on children's interpretation of symbols or figurative language.

> What is a slip knot? How does it work? . . . Let's see what our dictionaries tell us . . . Can you see now why Phil tied a slip knot in the rope he used in rescuing the fawn?
>
> First, let's review the key for reading the map. What does the brown area represent? The green?
>
> What is meant in the story by the statement that the woman stirred up a wasps' nest?

Questions leading pupils to a dictionary can help them get in the habit of using a dictionary whenever they run into a word that they do not quite understand. A dictionary will be helpful to children, of course, only to the extent that they know how to use its resources.

## Questions to Bring out the "Whys"

With questions that ask "why," a teacher leads pupils to think about situations in relation to their causes. Deciding why story characters might feel and act as they do, seeing what scientific principle explains a health "rule," figuring out the reasons behind historical facts -- all these involve perceiving cause-and-effect relationships.

> Did Robert want to help with the sap-run at first? Why not? How do you think he felt? Why did he feel this way?
>
> Why does putting foods in the refrigerator keep them from spoiling?
>
> Why won't electric current flow when the covering (insulation) is not removed from the ends of the wire?
>
> What reasons can you give to explain why Cortes and a handful of men were able to conquer the huge Aztec nation?

Almost any good lesson needs to include some "why" questions. If a teacher asks them often, she will find pupils looking for "reasons why" on their own as they explore new topics in every area of the curriculum.

To encourage pupils to think in terms of "What caused this? What will this cause?" a teacher might have them discuss the probable outcome of a story had a particular incident been changed: "What might have happened if Jean had lost her temper?" "What might have happened if Andy hadn't noticed that Don looked lonesome?"

Similar questions can lead to thought-provoking discussion in other areas of the curriculum: "What might have happened if the United States hadn't purchased Alaska?" "What would happen if water didn't evaporate?"

## Questions to Highlight Important Ideas

Certain kinds of questions can contribute a great deal toward helping youngsters pick out and remember the main ideas in a lesson. These questions can also help pupils organize their thinking about the lesson in a logical way.

> What was the first important happening in the story? The second? What was the next important thing that happened?
>
> Our experiments have helped us learn several things plants need in order to grow. Who can tell us what they are?
>
> How should we organize the report of our trip to the fire station? What are the main things we want to tell?
>
> What are the main things Dr. Deaumont learned about the stomach from his early experiments on digestion?

To point up the main ideas in a story or article, a teacher might ask pupils to skim through it and decide where it can be divided into parts. After discussing what a particular section is about, the class might suggest a subtitle for it appropriate to the important idea presented.

Kinds of exercises that help children perceive main ideas are reproduced on one side of the Interpretation Skills Chart listed among the free resource materials.

## Questions to Help Pupils Pull Ideas Together

Questions help youngsters pull a number of ideas together and draw an appropriate generalization from them. Often it is important to ask questions that will alert children to the dangers of generalizing from too little evidence.

> Let's think about what caused the mix-up in the story you just listened to. Did Jimmy hear the words Grandpa Peters said? Did he understand what Grandpa meant? If Jimmy had taken time to answer Grandpa, would the mix-up have happened?
>
> Why can we substitute 2/4 of .5 for 1/2 when we compute? What other numerals might be used for 1/2? Did you ever stop to think that a number can have many different names?
>
> If you found an insect with wings, would it be correct to say that all insects have wings?

## Questions to Help Pupils Apply New Understandings

Not to be overlooked are questions that help pupils see how they can apply the understandings developed in a lesson to new situations or to problems that they may sometime face themselves.

How did Nelson feel about what happened to him? Did he laugh with the others at first? Is it sometimes important to be able to laugh at yourself? How does it help you?

Suppose you found a letter on the street with a stamp on it that had not been canceled. What would you do with it? Why?

Why should you "warm up" your muscles before a strenuous game? What are some warm-up exercises you have seen football or baseball players use?

Would it be a good idea to check the air in your bicycle tires if you are doing a lot of bicycling on a hot day? Why?

Through questions that point up the ways new ideas can be used, a lesson takes on personal meaning for children.

Presenting short case studies and asking questions about them can help boys and girls see how they can use the ideas developed in a lesson.

"I hate to be in the class program," thought Florence. "In fact, I'm scared to stand up in front of people and give a talk. There must be something wrong with me!" I don't think Florence is the only one who ever feels shy or scared. Do you think Florence is the only one who ever feels a little shy or fearful? What advice might you give her? What might she do to help herself get over these feelings?

## RESPONSIBILITIES OF TEACHERS IN DEALING WITH CONTROVERSIAL ISSUES

Schools have a responsibility to help students develop habits of critical thinking in dealing with controversial issues. Teachers, however, when teaching controversial issues should be well-informed and should be aware of the difficulties involved.

A committee of the National Council of Social Studies has stated as follows the teacher's responsibility both to his students and to his community, in dealing with controversial issues:

1. To present or to permit the presentation of significant current questions by the class. Such questions should be considered in the light of their suitability for the age level and the community.

2. To help students obtain an adequate quantity and variety of materials representing all sides of the question.

3. To help students form their own working questions, pursuit of which will lead to greater understanding of the problem.

4. To call attention to the case for unpopular causes is necessary to assure a well-rounded consideration of the question. Points of view should be associated with their sponsors rather than with the authority of the teacher.

5. To help students distinguish between fact and opinion and to form their opinions from the available facts, rather than to look for facts to support a preconceived opinion.

6. To help students discover common goals and areas of agreement while recognizing that the generalizations and conclusions of individual students need not be alike.

7. To encourage students to make up their minds on the issue, rather than to remain in a state of indecision. Open-mindedness and willingness to change a conclusion should be recognized as an essential of critical thinking.

8. To exemplify good social behavior in a controversial situation. "In the heat of discussion it is important that the teacher shall be the most willing to hear another out; the least willing to point the finger of scorn at an unpopular position; the most willing to explore to the very bottom any position which may be taken; the most willing to examine critically his own position; the fairest, the coolest, the most factual person in the discussion."

9. To keep in mind his purpose: the development of informed and responsible citizens.

10. To "refrain from using his classroom privileges (and prestige) to promote partisan politics, sectarian religious views, or selfish propaganda of any kind."[3]

The teacher should seek to guard against trying to persuade the class to believe in his own particular point of view. The teacher's function is not to lead the class to the answer which he considers desirable, but rather to develop in his pupils skill in critical thinking about social problems of significance.

Often it is wise for the teacher to make clear to the class his desire to bring out all sides of a question and the fact that he may present arguments for any side, without necessarily being committed in belief to that side of the controversy.

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[3] National Council for the Social Studies, Committee on Academic Freedom. "The Treatment of Controversial Issues in the Schools." Social Education 15: pp. 232-36; May 1951, items 1 through 10.

Most of the major issues facing society today are not appropriate for discussion in the lower grades. However, when issues arise which young children can identify as controverisal, they should be discussed.

## ROLE OF THE TEACHER IN TEACHING CONTROVERSIAL ISSUES[4]

To contribute toward the decision as to what issues should be studied, the teacher must realize that -

> Pupils bring strong convictions with them.
> Pupils' convictions are usually picked uncritically without evidence.

He must not indoctrinate. (He must not try to replace pupils' unexamined opinions by his equally unexamined opinions.)

He should take part but not dominate. (He may give opinions but state that they are opinions.)

He should realize inherent values -

> Parents often do not want basic views of children changed.
> Majority or minority groups may oppose.

He should protect himself by making clear that -

> He is not seeking to teach a point of view.
> He is creating a situation in which the pupil can clarify his own understanding.
> He is establishing an atmosphere of inquiry.

The role of the teacher in the discussion of controversial issues involves two major responsibilities, aside from the willingness to make as careful a study as possible of the subject matter:

> To have adequate knowledge of where learning materials may be found.
>
> To know effective group discussion techniques. It must be understood that the purpose of many discussions is not to arrive at a definite conclusion. For both teacher and pupil, it is important to recognize the problems involved, to respect those who disagree with you, and to know that conclusions may be tentative.

(The teacher must believe that the matter of pupil growth and pupil learning is the paramount objective of the school.)

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[4] National Education Association, Controversial Issues in the Classroom, (N.E.A., 1961) pp. 23-24.

## A GOOD CLIMATE FOR CRITICAL THINKING[5]

Some characteristics of a desirable social-emotional climate for critical and creative thinking are:

1. The feeling that problems are natural to all people, both individually and on a group basis.

2. The understanding that it is good and proper to bring up problems and issues for discussion ...that there need be no agreement on the solution of a problem...that many times there are no magic formulas, no "right" answers to questions.

3. Agreement that the opinions of all persons in the class will be respected when they are based on facts or evidence.

4. Recognition that there is no one authority, such as the teacher, the textbook, or other source of information, that can be regarded as able to provide the final solution to a problem.

5. The practice of giving certain problems priority of consideration because they affect more people than problems which involve one or two. Even such problems, if in their implications they involve others, become common concerns.

6. The belief that critical thinking is essential to successful living and is a continuous process involving checking and rechecking of facts and conclusions.

## OUTLINE OF STEPS AND SKILLS IN CRITICAL THINKING[6]

| Steps in Studying Issues | | Skills Needed by Students to Recognize when issues arise. |
|---|---|---|
| Defining the Issue. Once it emerges, the issue must be narrowed and defined to leave no question about its meaning. | 1 | Recognize when issues arise.<br>Define and state an issue or problem clearly. |

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[5] Reprinted by special permission from Critical Thinking published by Wesleyan University, Middletown, Connecticut; and the Junior Town Meeting League, 1956, p. 14.

[6] *Ibid.*, p. 20.

| | | |
|---|---|---|
| 2 | Explaining the issue. The issue must be broken down into its various aspects so that students can clearly see what is included in the issue. | Analyze or break down a subject into its component parts.<br>Remember and make use of what has been learned. |
| 3 | Suggesting Hypotheses. Once the limits of the issue have been agreed upon, the group must set up a number of hypotheses or possible solutions. | Suggest a number of possible solutions to a stated problem. |
| 4 | Collecting and Recording Data. Since data collected are to be available to the whole group, all facts must be recorded in a form usable by the group. Agree on data required and form for recording them. | Find data.<br>Collect and record data so that they may be used in the consideration of an issue.<br>Interpret maps, charts, and graphs, so as to extract the data they may contain. |
| 5 | Presenting Data. Methods of presentation are needed which will get the data across in the clearest fashion and in a form best adapted to the group's needs. | Arrange data in an orderly and logical sequence.<br>Present data clearly and without distortion. |
| 6 | Appraising Data. All data must be appraised before they can be used for testing hypotheses. This sifting process leaves a residue of data for use in the final steps. | Detect errors in data.<br>Find inconsistencies in data.<br>Evaluate data and determine their proper weight as evidence. |
| 7 | Testing Hypotheses. Each hypothesis must be considered in relation to the data. Students must balance all the data and determine whether or not the evidence supports the hypothesis. | Synthesize, or put parts together into a related whole.<br>Hold in mind a number of facts and draw conclusions from them. |
| 8 | Determining Possible Conclusions. Having tested all hypotheses, the students must decide whether or not | Spot false analogies.<br>Recognize when data are inadequate for reaching a conclusion. |

| | |
|---|---|
| any conclusions are possible. If any conclusions are accepted, they must be carefully stated with supporting evidence. | Recognize the validity of conclusions which may conflict with the students' views. |

## OBSERVATION RECORD ON CRITICAL THINKING[7]

The teacher may wish to develop a rating technique or observation record which will help systematically to gather evidence on the behavior of students in class. Some questions which such a technique should attempt to answer may be the following:

1. Is the student becoming more sensitive to the existence of problems in current affairs?

2. Is the student formulating problems more clearly?

3. Is the student formulating problems in forms which can be attacked?

4. Is the student becoming more skillful in stating hypotheses and alternate possibilities for attacking the problem?

5. Is the student becoming more skillful in locating relevant information?

6. Is the student becoming more careful in his observation?

7. Is the student learning to use written sources?

8. Is the student learning to play a variety of roles in cooperation with others as they attack the problems?

9. Is the student developing skill in organizing data, and in screening the relevant from irrelevant materials?

10. Is the student interpreting data more sensitively and accurately.

11. Is the student learning to draw conclusions more skillfully?

12. Is the student developing the ability to communicate the results of his critical thinking to others in written or verbal form?

13. Is the student aware of the ways in which his biases and emotions affect his critical thinking?

14. Is the student becoming more able to overcome emotional limitations on his critical thinking?

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[7] _Ibid._, p. 31.

## BRAINSTORMING PROBLEMS

The use of the brainstorming process is often helpful in bringing forth the best solution from a group for the handling of a problem. The three-step process in brainstorming is treated below.

The first step in brainstorming is for the teacher or leader to help the group define clearly the problem that will be discussed.

The second step: Brainstorm the Problem . . . . . . . . Remind the group-at-large of the essential function and rules of a brainstorm session. It is a technique for harvesting ideas quickly and in quantity. Each member is encouraged to toss out ideas as rapidly as possible and to "hitch-hike" aboard someone else's idea and to develop it as he wishes. No one must criticize, for critical analysis can come later. No one must be disturbed by wild ideas, for wild ideas can be tamed later.

Once everyone is clear about ground rules, have participants form subgroups of three to five persons each to meet at separate tables or in separate classrooms. Be sure that each subgroup appoints a recorder to take down ideas.

The third step: Organize for Evaluation . . . . . . . Brainstorming over, the various subgroups may not have a large number of ideas. These should be gleaned, corrected, edited, checked for repetition and copied so they can be appraised coolly and logically for possible value.

The brainstorming session will have been a distinct success if -- out of sheer quantity -- it nets but five or six new and effective ways to help solve the problem under consideration.

## EVALUATING CRITICAL THINKING

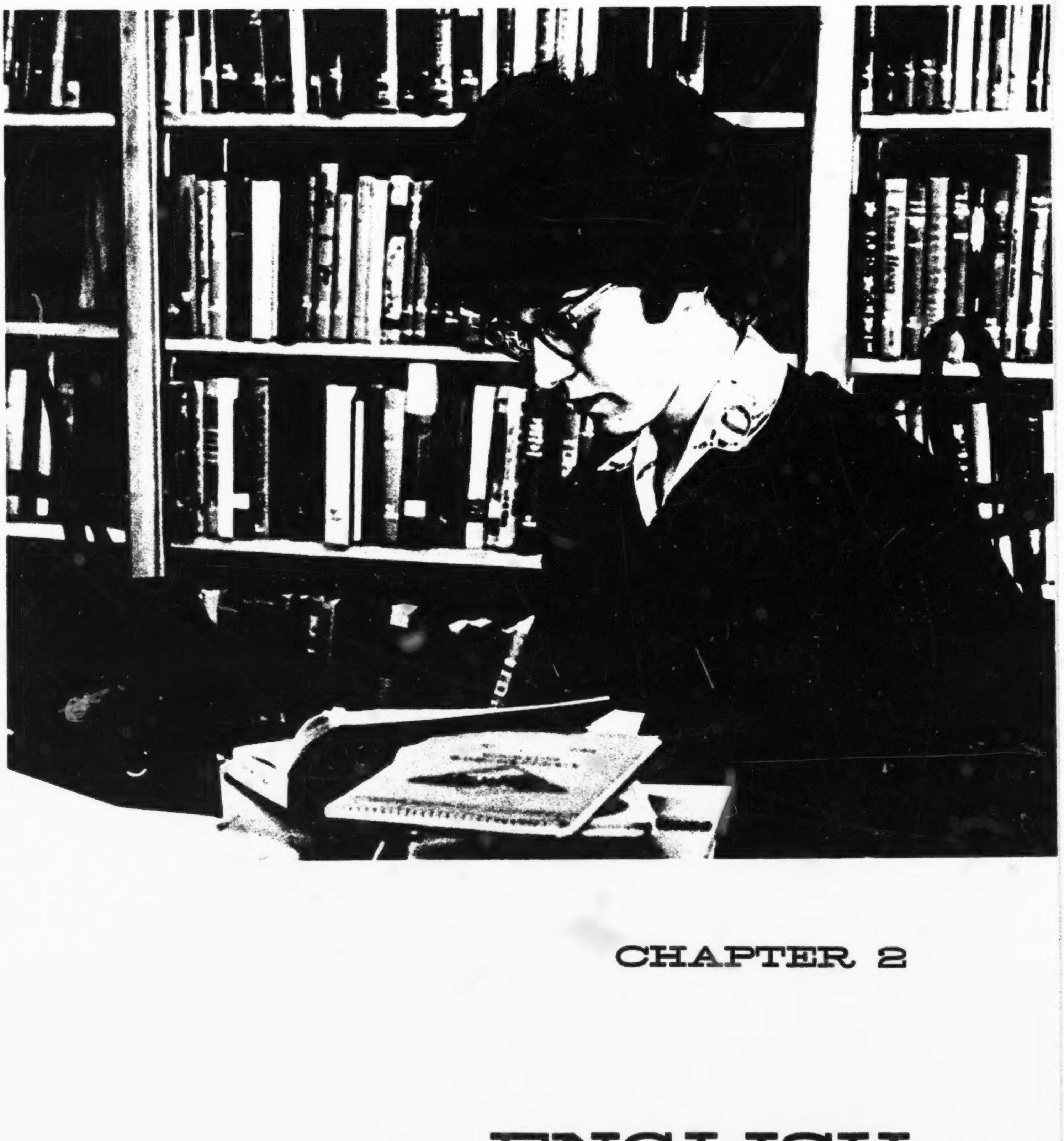
At the present time, there are few sufficiently valid and reliable standardized tests of critical thinking or problem solving which the interested teacher can use. The Watson-Glaser Critical Thinking Appraisal, published by World Book Company, Yonkers, New York, is perhaps one of the best standardized measures presently available. This test which consists of 99 items, is divided into five subtests, each of which purports to measure different factors related to the total concept of critical thinking, as follows: (1) Inference; (2) Recognition of Assumptions; (3) Deduction; (4) Interpretation; and (5) Evaluation of Arguments.

There are some promising approaches which teachers can use to evaluate critical thinking. At the elementary and junior high school level, one of the most valuable means of evaluating thinking is through observation. In connection with observation, the teacher may keep anecdotal records, notes, logs, and schedules. The extent to which students sense a problem, know how to select, organize and weigh evidence, and draw conclusions and test them in new situations may be revealed in student conversations, panel discussions, construction or painting activities, and reports. Teachers should analyze diaries, letters, essays, speeches, autobiographical statements, physical tasks involving problem solutions (fixing equipment, analyzing mechanical situations, constructing stage sets), play or games in order to develop a complete picture of the thinking of a pupil. It is important in order to develop a complete picture of the thinking of a pupil. It is important for the teacher to be close to the student and observe his thinking at various times in various fields or areas.

The interview technique also can be used successfully to appraise the thinking processes of pupils. In the upper elementary grades, in the junior high school, and in the high school, paper-and-pencil testing techniques can be added to observational and interview techniques as appropriate means of evaluating critical thinking or problem solving.

## CONCLUSION

Since life is full of problems which require intelligent solutions, critical thinking is of the utmost importance. Critical thinking, as it has been treated in this Introduction Chapter, is the process of solving problems. Truly in today's fast changing world with mountainous knowledge accumulating, the promotion of good critical thinking on the part of all students should be the over-arching goal of educators when consideration is given by educators to the over-all objectives of education in our elementary and secondary schools.



## CHAPTER 2

# ENGLISH

# PECULIAR EATING HABITS

English Grade 7

In one of our stories entitled "Li, Lun, Lad of Courage" by Carolyn Treffinger, we read that the Chinese people eat brown rice cakes seasoned with shrimp and seaweed. They gathered birds' nests for ingredients used in preparation of soup. Li Lun ate a raw sea gull egg on Lao Shan. In another story called "Nu vat the Brave" by Radko Doone, the Eskimos eat raw meat. It is pointed out that "a small amount of raw meat gives more strength and nourishment than the same amount cooked."

For each story, we talk about these unusual foods. Each time the students giggle over these peculiar food habits. Each time I remind the students that the Chinese and the Eskimos can laugh very heartily over our peculiar food habits. It really takes critical thinking at this point, for I interject the two most peculiar food habits the American people have. It is a shock to the students. It is noticeable on their faces. I insist that the eating of white bread and the eating of hot dogs are very peculiar habits.

I explain that the American people have been so brain washed for years with advertising literature from large flour mills and expansive bakeries to eat "snowy white" breads and pastries to promote the "shelf life" of these products that it is a shock to realize that the people in so-called primitive countries can often have much better diets than the wealthy Americans with their abundance of food. The Chinese boys and girls would giggle to see thousands of Americans consuming the starchy part of the grains while the animals are fed the wholesome bran and wheat germ. I explain that enriched bread is really a farce. The Chinese know instinctively the value of bean sprouts, brown rice grains, and the nutritious products of the sea, including dried seaweed.

The Eskimos would snicker to watch American boys and girls standing in long lines in school cafeterias to devour cheap scraps of meat highly seasoned with spices to camouflage their quality. We have no right to laugh because "the faces of little children were all glistening with the blubber they had been chewing."

It is a revelation to behold the looks of dismay on the students' faces at this point! They sense the realization of their mistakes. Some think critically and change their ways. Many proceed ignorantly in their habitual ruts of thinking.

I am heartened by the few who think the subject through to concrete action. Students start to bring me articles on the subject. Others quote their parents' remarks - good and bad. Some start to check labels on canned goods, frozen products, pastries, and meats. Some students break long standing habits to apply critical thinking.

## RELATING A STORY TO SELF

English  Grade 7

I believe that children are encouraged to do critical thinking through classroom discussions. In Language Arts I try to have the children relate the stories to their own lives. For instance, we just read a story which was set in China -- we then related the incidents of the story to our own environment.

1. Would the boy have been a coward in our country?
2. How would his parents have treated him if he were in the U.S.?
3. How much change would have taken place in your life if you had had to do something similar?
4. Write approximately ten sentences to show what feelings Li Lun might have had while he was alone on the mountaintop for four months.

## PROCEDURE FOR ANALYSIS AS APPLIED TO POETRY

English  Grade 7 - 8

Rule 1 - Keep an open mind.

Rule 2 - Apply the scientific method of gathering ideas from all possible sources, sort out those most logical and applicable, arrange them in sequence, and evaluate.

Rule 3 - Ask some further questions:

a. To or for whom was a statement first made?

b. When was it made?

c. Is it applicable in my time?

d. Summarize for a conclusion.

The above procedure may be used also for any phase of social studies and is particularly good for current events. It is applicable in evaluating any reading material -- literature and poetry. Of course the scientific method part of Rule 2 always applies in science. By such a procedure it is much easier to determine whether the reporting is objective, subjective, truth, or propaganda; it further applies to comprehension and appreciation.

These rules apply in creative writing and thus must, of course, be the result of critical thinking.

Application: "THE RAVEN" by Edgar Allen Poe

Rule 1 - Keep an open mind. Never form an opinion at first.

Rule 2 - Apply the scientific method:

- a. Read this poem and other poems by Poe.
- b. Read many poems on birds or on themes of reflection by other authors.
- c. Sort out the ones that may be similar or in contrast.
- d. Evaluate: In this case by comparison and contrast. How does "The Raven" impress me?

Rule 3 - Ask further questions:

- a. To or for whom was the poem written?
- b. When was it written?
- c. Would the author write similarly were he living today?
- d. How would I express such feelings as these in this poem which speak to me?
- e. Summarize for a conclusion:

  As a result of my having thought critically through these steps, do I or do I not like this poem?

## UNLOCK THE CLOSET OF WHY'S IN GRAMMAR

English Grade 8

If only the fog would lift! If only we all awakened to the realization that our primary purpose as teachers is not to teach geography, spelling, writing, history, modern mathematics, or what have you, but rather to show each child how to think clearly and logically for himself. Teach with this goal in full view. The teaching of your subject matter will then become more meaningful for you and for your children. And it's easy. You might very simply begin by unlocking your closet of "WHYS?"

As a language arts teacher, I see standing before me the child who can parrot so accurately a number of definitions from his book.

"Charlie, what is an adjective?"

"An adjective is a word that describes a noun."

"Yes, Charlie, now what does that mean to you?"

"Mean, Miss Mudge? Well, an adjective modifies a noun."

Now some language arts teachers may think their job well done because Charlie has memorized the book definition of every part of speech. It doesn't seemingly bother them that even Charlie is not recognizing correctly words as parts of speech. For you see what Charlie doesn't understand is:

1. What "part of speech" means

2. What "modifies" means

3. What a noun is, etc.

In essence, poor Charlie cannot analyze anything.

English grammar has always been that part of every language arts program that everyone dreads, detests, and complains about. To cite a personal experience -- my second grade daughter had come home from her first day of school this year. She was proudly displaying a grand array of new textbooks until. . . "Ugh, my English book!" She had not yet a formal English class, had not examined her book to know even what the course would consist of, but already it was "UGH!" Why? Her older school friends had already shared with her all their soured experiences that, that dreadful drudge called English.

However, English doesn't have to be a grinding ordeal of writing meaningless sentences and exercises and then checking the answers mechanically against the "we can't do without" key. Teaching children to think, to have a definite idea about what each wonderful word in the wonderland of language does, to be able to prove each idea valid, can easily replace the demand for memorization or bits of English jargon without any idea of how these bits fit together. Not "What is the answer to the first sentence?" but rather "What do you think that word does, Charlie?" "Do you agree with Charlie? Sam? Jimmy? Jane?"

This classroom procedure of merely letting each child know that you will demand from him an opinion substantiated by valid reasoning rather than a memorized garbage collection becomes contagious. Why let a child subject himself to ridicule by mechanically guessing - sometimes correctly, sometimes incorrectly - when you can by asking a few choice Whys? force him to begin to think. Nothing gives me more pleasure than to see a child, ordinarily considered irresponsive, raise his hand to tell us not what the adjectives in a particular sentence are but rather why he knows this and this and this have to be adjectives. They have to be because . . . . . . . . . . . . . . .

He has not guessed and found three out of four right - " . . . good enough . . . " - " . . . don't know why three are right and one is wrong, but who cares? . . ." ". . . I passed . . ."

He has thought. He has analyzed. He knows why each word is an adjective and hereafter any word that does that same thing will have to be an adjective, too. The fog has lifted for him. Maybe English grammar isn't such a drudge after all. But most important, he is beginning to think things through.

English grammar is full of whys. Find them. Ask them. Help your children put together the pieces of their language puzzle. Don't accept rote definitions or guess work on assignments. Demand thinking out the answer. It doesn't really take any more time, and the results are much more rewarding. I know. I used to be a mixed-up "jargonist" myself.

## SEMANTICS AND PROPAGANDA

English Grade 8 - 9

One of the units which I use in ninth grade English classes to teach critical thinking is a unit on semantics and propaganda. We identify the problem by discovering that the same word can have many meanings. I use exercises in finding word derivations, in discovering interesting origins of words, in recognizing the word as a symbol for its referent, in discovering changes in meanings as a result of context, and in finding changes in meanings because of our connotations for words. Thus, the students become aware of euphemism, "loaded words", multiple meanings, and ambiguities in their language and realize that communication even in the same language can be a problem.

From the study of words and groups of words, the unit branches out into an examination of the differences in reports, inferences, and judgments. The student realizes that "She is a nice girl," is merely an expression of opinion, not necessarily a verified report. The appeal techniques in advertising, the reports and editorials in newspapers, and the slanting in political propaganda are examined and discussed with the result that the students come to recognize their own biases and prejudices as well as the biases and prejudices of others.

One of the most valuable results of this unit is that the student learns to suspend judgment until he is certain he has the facts. It also teaches him that no two Americans agree as to the meaning of an abstract word such as "democracy"; therefore, it is not surprising that an Englishman, a Chinese, and an American would have difficulty reaching an agreement on its meaning. Because of his new awareness in the realm of definition, he becomes more wary of labels for people such as Democrat and Republican, Socialist and Capitalist, etc., and is less likely to prejudge people before he has the facts. I feel that the student, therefore, learns not only critical thinking as a result of this unit, but he learns also that there are biases and prejudices which surround and influence his thinking and he must be on guard for them.

## HOW TO DETERMINE TRUTH FROM NEWSPAPERS

English

Grade 8 - 9

The American newspaper has such a great influence on thinking today that if the reader has not been taught critical thinking, he is at its mercy. Since most students will read the newspaper, if nothing else, we must, I feel, begin with it to teach critical thinking.

I usually make arrangements to get a current week's supply of a morning paper and a different afternoon paper so that interest will be high. After the papers have been perused, and we have discussed techniques of news writing, sources of material, and advertising, we begin the really important task -- thinking critically about content.

I begin by asking such a question, "John, what do you think of the Sidney murder trial?" Actually any controversial local issue will do. As John and the others voice their opinions, our class secretary writes them on the board. Then the examination starts. I usually take an opposite position if none is presented, perhaps, by saying, "A friend of mine who knew the detective said . . ."

With all three variations at hand (my statment or another opposite one, the morning paper's and the evening paper's), the critical thinking begins.

Our goal -- "What can I reasonably assume is true?" This we accomplish by use of comparison, quoted sources, and fact versus opinion. By the time we have handled a local article, an international or national one, and the editorial page, I feel we have at least had an awakening to critical thinking.

## READING AND LITERATURE

English

Grades 7 - 12

It is important that useful information which has been located, evaluated, and organized, should be retained for some future purpose. Often the pupil wishes to present the information to others in a meaningful way. Fortunately the objectives of retention and reporting can often be achieved simultaneously.

At our schools, retention is achieved through the use of the S-Q-R method. S-Q-3R means Survey-Question-Read-Review-Recite. Briefly S-Q-3R contains these basic ideas:

Survey -- Survey the material to be studied by glancing over such helpful items as chapter outlines, picture captions, maps, charts, graphs, and summaries.

Question -- As you survey the material, begin to formulate questions to help you comprehend information needed to fulfill your purpose. (What does the title mean? What new information am I likely to find? What is the theme of each chapter?)

Read -- Read to answer your questions. Adjust your reading rate according to your purpose and the difficulty of the materials.

Review -- Review what you have read. Get things in the correct order. This is the stage of S-Q-3R at which you become master of what you have read.

Recite -- Recite important points of information to yourself. This helps to organize material as well as to strengthen retention.

S-Q-3R is particularly valuable in preparing for a class discussion or for an examination.

## POINTS TO CHECK IN COMPOSITIONS[8]

English Grades 9 - 12

Students who call a composition finished when the first draft is written may not know where to begin on the job of revision.

Here are tips to help students improve their compositions, help them turn in papers that need less correcting. The material comes from the "Writing a Composition" chapter of Guide to Modern English for Grade 9, (Scott-Foresman).

Questions to Ask About Content --

"A good way to test your paper is to put yourself in your reader's place as you go over it. Will the beginning sentneces get the reader interested and make him want to read on? Have you provided enough details to make each phase of your subject clear? Are they all the right details? Or did you include one or two details that really do not belong and should be eliminated?"

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[8] Information in this item was taken by permission from Junior English Highlights, an In-Service Bulletin published by Scott-Foresman Company in April - May, 1963.

"Do your paragraphs make clear what topics you are covering? Are your paragraphs linked so that your reader can easily follow your train of thought? Have you used words that express your meaning. exactly? How effective is your ending?"

Checking the Mechanics --

"You should pay especially careful attention to the matters you may not have given full attention to when writing -- grammar, spelling, and punctuation. Have you written complete sentences? Have you shown where each sentence begins and ends? Have you used all the punctuation marks you need? Check to see that you haven't used too many exclamation marks or dashes or have not enclosed words in quotation marks unnecessarily. Is there a good reason for every capital letter? Are there any misspellings?"

Making the Final Draft --

When you are satisfied that your paper says what you want it to say, clearly and effectively, copy it neatly. Then proofread carefully.

## HELP STUDENTS SET A PURPOSE FOR READING[9]

Reading and Literature

Grades 9 - 12

### Questions Help Set Purposes

Let's say that students are about to read an article on the origin and history of marathon races. A teacher might ask, "Why do modern Olympic games feature a marathon race?"

Asked before students read, this question provides a purpose for reading and for watching for cause-effect relationships, a comprehension skill that most students need to develop further. If the same question were not asked until after students had read the article, comprehension would be tested but not developed.

If teachers help students to read purposefully by systematically asking questions before students begin a reading assignment-whether in English or some other subject-matter area this questioning will soon seem a normal part of the reading process, and gradually the students will learn to do it for themselves.

To help them set their own purposes, students can be encouraged to skim what is to be read, look at pictures, read headings, review what they already know about the subject. Then they should be able to answer questions like these:

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[9] Olive S. Niles, "Helping Students Set a Purpose, "English Highlights, Volume 20, April-May, 1963, No. 4.

1. Is this something we can read rapidly, or must we study it slowly and carefully? Why?

2. What are some of the things we should try to find out from this reading?

3. How can we use what we find out?

### Directed Reading is Good Teaching

With young students, the silent reading and study that follow the identification of specific purposes should be closely supervised and done with brief sections of text material. As students mature, they can do more and more alone, for they will gradually learn to formulate their own questions and keep in mind several purposes simultaneously.

Secondary teachers may feel there is too much "hand-holding" in this directed-reading-lesson approach. In a sense good teaching is hand-holding; it is leading the students through a process until they can "walk alone" and rarely does this time come abruptly.

## DECISION MAKING

English Grade 10

In our literature book, Adventures in Appreciation by Loban, Holmstrong, Cook, we have four short stories which deal with making a decision and the results of the decision which was made. Through group discussion, individual reports, and panel discussions, we evaluate the decision in light of the conditions present at the time the decision was made. We also discuss other possible decisions. We follow this with themes concerning decisions made by individual students, the circumstances prompting the decision, and the evaluation of the decision.

Themes for other short stories which promote critical thinking are:

"Seeing Human Beings as Individuals"

"The Universal Need for Affection"

"Contrast Between Selfishness and Generosity"

In all of our literature we seek to find the deeper meaning to the story, poem, or play, which we are reading and try to relate that idea to the individual's experience, sometimes through discussion, sometimes through a skit, and many times through written composition concerning individual thoughts, ideas, or experiences with a given subject.

For example, while reading Silas Marner, we write themes about:

"Money Versus Human Relationships"

"The Poison of Selfishness and Injustice"

"The Consequences of Character"

## WRITING PARAGRAPHS

English

Grades 10 - 12

In order to urge students to think, an attempt is made to teach some practical techniques used in writing exposition and description.

Naturally, the first lesson is a review of the basic requirements in the development of a paragraph (central idea, unity, coherence and emphasis).

Young writers who lack experience need help to learn how to think before writing. Exposition introduces to the student a simple technique built around four steps involved in writing a definition.

(1) Name an object or abstract idea

(2) Use is or are

(3) Follow with a noun. Modifiers are permitted. (Stress here the idea of completing the thought)

(4) Add the particular qualities. Before writing this paragraph rehearse the rule orally. Student's work is graded on the basis of how carefully they followed the rule. Point out that this is a pattern. Many variations may be used. This provides for originality and individual differences.

The next lesson introduces description and the addition of detail. Here the student is urged to establish his "point of view". He is also encouraged to project himself into his writing by introducing mood. There is no positive rule given at this point, but examples are read from literature and students discuss the thinking of the author. Further work on paragraphs is developed around comparison and contrast, cause and effect, and repetition.

This series of paragraphs is completed during one grading period. During the succeeding periods longer themes are introduced. However, if necessary this procedure is repeated, as the teacher believes that before a student is competent enough to write a theme he must first produce a good paragraph.

## HELPING STUDENTS TO BROADEN THEIR UNDERSTANDING

English Grade 11

I know of no better method to keep a critical attitude before students than a constant adherence to the old journalistic formula of who, what, when, why, and how. To keep students in a position to constantly compare, evaluate, and select should not be the goal for a single situation, but for all situations.

One method I have used, and one which I prefer, combines listening and speaking situations, along with vocabularly study. For example, with the word anthropomorphic, I often refer to Rupert Brooke's "Heaven", which deals with the fishly anthromorphic being. I mention that at least one critic has found the poem sacrilegious and let them discuss why this may be. Very often, the discussion will lead to more primitive religions and further research on the part of students into the symbolism involved in the forms given to various pagan gods. After such exploration, they are able to evaluate more critically their own roles in relation to people of other beliefs. My ultimate aim is to further not only a critical approach of the student toward a segment of his own philosophy, but also to help him toward a broader understanding of the world in which he lives by broadening his understanding of other peoples.

## WRITING BOOK REVIEWS

World Literature Grade 12

In the writing of book reviews (to be distinguished from book reports which give title, author, list of characters and summary of plot), students are required to practice critical thinking. Because I believe so strongly that novels reflect the critical thinking of authors, I expect my students to discover the author's development of ideas and to exercise and reflect critical thinking in their reviews.

After students have read a book, they are expected to define the problem the author presents and state the theme of the book in a single sentence. Next, they are to explain how the author develops his theme through choice of incidents, character development, and progression of plot. Finally, students are to explain the solution to the problem which the author poses, or if the problem is beyond solution, the author's reasons for contending that there is no solution. When all this information is gathered, students are ready to begin work on their book review.

After a short explanation of the author's theme, method of development, and solution, students are asked to make their own observations about the value of the author's work; in doing this, they are expected to bring into their work specific reference to other works which have treated the same problem. (The class reads a book a week. These are assigned in units:

e.g. reactions to war, Red Badge of Courage, All Quiet on the Western Front, Hiroshima).

The writing of each review is expected to be cumulative from their growing experiences with books. After the class has written a few reviews from their own observations and feelings about the books, they are taught to use the sources provided by professional reviewers (Book Section New York Times, Saturday Review, Book Review Digest).

Sometimes when students find that there is disagreement among professional critics, and sometimes when students disagree with the analysis of others, they re-read the book and re-write their review.

In evaluating their work, I am most critical of the hasty generalization, the unsupported conclusion, and the lack of suspended judgment until all the sources are evaluated.

## CONCEPT OF THE TRAGIC HERO

English                                                                 Grades 11 - 12

In an Advanced Placement course in English, the major problem for a unit in the study of the drama was: How has the concept of the tragic hero changed since the days of the Greeks to the present day? To find a solution, the first step was obvious; the students must read plays from the various periods of dramatic history. So the tools were selected: Oedipus, Sophocles; Hamlet and Macbeth, Shakespeare; A Doll's House, Ibsen; and the Death of a Salesman, Miller.

In critical thinking, a reader must go beyond the "what-is-the-story" stage. He must read, compare, appraise, and form a final judgment. As the students read, these additional problems were presented: What was the author's purpose in writing? For whom were the plays written? From what kind of social background did the hero arise? How do the plays reflect the image of man in the day it was written? In what way is the concept of man different from, in what way is it like the image of man in our times? What was man's attitude toward God? What is symbolism in literature?

To give a complete answer to the above questions, would be to give the findings of the whole course. However, through research, appraisals of writers and characters, comparison, and extention of self into periods before the present age, the pupils collectively saw the change. From a tragic hero who was an aristocrat who was victim of the gods, through the Shakespearean concept of the aristocrat who was responsible for his own decisions, the class moved in thinking through Ibsen to the opinion that any middle class man or woman could be subjected to tragedy as moving as that of kings or queens. Finally, in the play by Miller, they saw in modern life the tragedy, that could arise from an ordinary man's failure to face reality and from his false values in life.

Critical thinking can arise, I believe, from any phase of English, writing, reading, listening, or speaking, if the pupils are exposed to the process.

## PUBLISHING THE SCHOOL NEWSPAPER

Journalism

Grades 11 - 12

In the field of journalism, the problem-solving techniques are definite and realistic; the solutions to problems depend upon the individual's working alone and the group's working together. The following material will cover only the major problems involved in publishing a school newspaper and only a few solutions will be given.

Problem: Who shall have the responsibility of publishing the school newspaper?

The trained, or the un-trained? The responsible, or the irresponsible? The teacher-selected staff, or the teacher-student selected staff.

Solution: Through a joint discussion of journalism students and teacher, an evaluation of personality traits and ability is made with the objective of selecting a staff who will reflect the best interests of the student body. The solution is that the chief positions should go to the pupils who have shown writing ability, cooperation with others, and a sense of responsibility. Thus a staff is chosen through the combined effort of teacher and pupils.

Problem: How can the staff raise the needed $3500 for the yearly publication budget?

After a discussion of the cost of each issue in printing and making engravings, the staff decides upon group solution. The circulation manager accepts the responsibility of raising $1500 through a subscription drive. The advertising manager agrees to sell $1500 in advertisements. The editorial staff agrees to earn the additional $500 through projects which vary with the year.

Problem: What shall go into the paper to make it one the students want to read and that will reflect the best journalistic principles. To arrive at a solution this problem must be broken down into the following: How is a good newspaper dependent upon truth and accuracy in reporting? What is good taste in writing? What is the difference between the personal touch and gossip? How does one avoid slanting the news? How does writing show bias, prejudice, and glittering generalities? How do we define propaganda? Why is correct spelling, good grammar, and clarity important and vital?

Solution: The materials that go into the paper show how well these problems have been solved. They are constant.

Problem: Evaluation; How good was the paper just issued?

Solution: Each Friday after the paper is issued, the entire staff meets to discuss the good points and the weaknesses of the current issue. Each page editor is given the opportunity first to criticize his own page. Often they are their own best critics. Goals are then set for the next issue.

## CHECKING THE AUTHORITY OF SOURCES IN JOURNALISM

Journalism Grade 11

One of the major problems in journalism (perhaps more so than in most fields) is to train the student to look for fact, not opinion. When opinion is the only available source, then the student has to learn that authoritative sources are best.

In this, I have tried, successfully, I believe, by beginning the class with some absurd statement like, "Did you know the moon is going to crash into the world in the next twenty-four hours?" After the general laugh is over, it is easy to discuss why such a statement from me seems amusing or silly, and why it would have to come from an authoritative source to be serious.

We trace sources where individuals can be checked as to their authority to make specific statements; we discuss keeping files of statements made by persons whose veracity may be doubted.

In the field of journalism, checking the authority of sources is a constant duty. I believe this carries over into other areas where critical attitudes are important.

## ASSIGNMENTS AS AN INTRODUCTION TO LOGIC

English Grade 12

I find that seniors tend to accept whatever they find in print without any critical evaluation of the reasoning involved. This tendency is aggravated if the writing includes convincing points the student has not considered. Furthermore, students often fail to have labels with which to criticize thinking, making it difficult for them to pinpoint fallacies. They often support, for this reason, arguments that they vaguely feel are in error. They find themselves cornered by bombastic rhetoric and all they can do is surrender. To overcome these two difficulties, I have devised the following assignments as an introduction to logic, a part of the senior English program:

1st day: Students write an argumentative essay on the subject, "Science has Benefited Humanity." (Almost all students write affirmatively on this subject.)

2nd day: Students are given an essay on this subject. (Accompanied by impressive bibliographic notation), taking a negative stand. Students are asked to add a paragraph defending or rejecting their opinion expressed in their essay.

3rd day: Student switches in opinion are tabulated. Then I point out a few representative fallacies in the hand-out essay. In small groups, each of which is assigned one paragraph, other fallacies are uncovered.

4th day: Each group reports on its paragraph, and I attempt to guide the students in classifying kinds of fallacies. When we have a list on the board in the students' own words, I direct the students to apply these errors in checking their original papers.

5th day: Students comment on the results of their analysis, and the class discusses their "vulnerability" to faulty reasoning.

By these assignments I find students motivated to pursue a more systematic study of logic with a greater urgency than they might otherwise have.

## HOW TO MAKE AN INTELLIGENT CHOICE OF A LIFETIME VOCATION

English Grade 12

1. In cooperation with the vocational guidance department, go over personal folder containing 10th grade Kuder Preference inventory scores, cumulative high school grade record, essays written by the student during various years on vocational possibilities, and records of conference with vocational counselors.

2. Take Kuder Preference inventory again, recording scores and comparing them with 10th grade results to see if there is any noticeable change.

3. Select two possible vocations, at least one of them being in a high percentile on the latest Kuder inventory.

4. Gather as much information as possible on 3 x 5 cards, books, periodicals, interviews, and audio-visual sources.

5. Write a comprehensive paper to bring out all the pertinent information on each vocation.

6. Make a comparison of the two vocations as to their suitability.

7. Come to a logical conclusion regarding the feasibility of either vocation, rejecting both if that seems advisable.

## HOW TO SHARPEN ONE'S PERCEPTION OF CHARACTER TRAITS

1. Make personal observations and deductions from reading a class-assigned work.

    a. Note the actions of the characters being studied.

    b. Note their words -- the matters spoken of,
    the matters left unmentioned,
    and the manner of speaking.

    c. Observe the opinions of others in the work under consideration.

    d. Note the attitudes of others associated with the characters.

2. Discuss and compare personal observations made by others in the class.

3. Evaluate personal opinions as justified or unjustified.

4. Try to carry over into life-experiences some degree of objective observation.

## CHALLENGING THE LOGIC OF ASSUMPTION

Creative Writing, Journalism — Grades 11 - 12

An interesting technique for promoting thinking may be based on such a simple object as a penny. Students are asked to assume they are part of an expeditionary force from some other planet, perhaps Mars. The year is 3000 A.D. and they have landed on the barren, dead planet Earth. Absolutely no sign of life is apparent anywhere. Just as the explorers are about to board their space ship and head back for Mars, one of them dejectedly kicks at a rock and uncovers a small copper disk (penny).

Now, the thinking project for the class is this: What logical assumptions can they make as to the kind of civilization (if any) that once prevailed on Earth? The class should be given a common starting ground. That is, they should know the answers to such questions as the following:

How civilized are they, as Martians? Are they advanced enough to be able to get meaning from the words on the disk? Are they similar physically to Earthlings?

In (this writer's) classes, I have found that assuming Mars to have passed through and beyond a civilization similar to that of Earth leaves plenty of room for alert thinking. If not given this common starting point, students are prone to labor over the Martian himself. He may be an ant or an elephant or a frog. He may have no brain at all. Perhaps he's blind. Maybe he has no language at all; he communicates by rubbing elbows.

Here are a few conclusions students are likely to make from their study of the penny:

1. Life definitely existed on Earth.
2. Earth people were highly civilized.
3. They were skilled in metal work.
4. They had a numerical system.
5. Their customs included the wearing of protective covering of some kind.
6. This clothing indicated that at least part of the Earth year was cold enough to require protective covering.
7. Plant life existed.
8. Heads of grain indicated a possible agricultural economy.
9. Fine engraving indicated artistic talent.
10. They used at least two different languages.

NOTE: Good students will usually come up with 15 or 20 of these deductions, and usually a lively class discussion can be counted on as students challenge the logic of certain assumptions.

## METHODS OF TEACHING[10]

English

Grades 7 - 12

1. Definition

The Directed Discussion as a method of instruction is:

a. A means of acquiring new knowledge, of exchanging ideas, and of standardizing principles, procedures and techniques.

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[10] Armed Forces Staff College Leaflet.

b. A means of providing opportunity for the students to participate in the presentation of the subject matters involves discussion and participation by the students and provides guidance through questions and summary by the instructor.

2. Type -- Teacher-Student Centered Activity

3. Purpose

    a. Primary purpose is to force the student to think.

    b. To produce a socialized classroom situation as opposed to the rigid formality of the lecture method.

    c. To furnish personal contact between instructor and student.

    d. To let the instructor know how much the student has learned and how much material should be reviewed.

    e. To enable the instructor to discover leadership qualities in students.

4. Use

    a. To provide informal expression of personal experiences and information not in the text.

    b. To provide for student questions and teacher answers as well as teacher questions and student answers.

    c. To allow for student as well as teacher leadership.

    d. Most effectively used in small groups (under 25).

5. Procedures involved

    a. Instructor must prepare visual aids and hand-out material in advance.

    b. Instructor arranges seating for best discussion results, usually in a semi-circular or circular fashion.

    c. Instructor explains the ground rules:

        (1) Stick to subject (must not be allowed to wander from the topic).

        (2) Keep statement factual.

        (3) No arguments - one voice at a time.

        (4) Participation by all members.

(5) Be concise.

(6) Questions, answers and ideas wanted.

(7) Notes may be taken for jotting down ideas as discussion progresses.

(8) Courtesy and tolerance to all.

(9) All members must give undivided attention.

(10) Summary time must be allowed.

d. Instructor writes subject or problem to be discussed on blackboard, explains it briefly. (This is not the place for even a short lecture).

e. Instructor starts discussion with a short, thought-provoking question. This question or several alternative ones should be prepared in advance and should start with How, What or Why.

f. Instructor stays out of the picture as much as possible; asks additional questions as necessary to guide the discussion and copes with the disruptive nuisance types such as:

(1) The pigeon-holer -- Wants all tucked away in notebook

(2) Hair Splitter -- Relies on Roberts Rules of Order more than substance of subject

(3) Eager Beaver -- Inclined to broad-jump to conclusions

(4) Fence-Sitter -- Lacks confidence

(5) Wise Cracker -- The group clown

(6) Superior Being -- Maintains detachment

(7) Silent Member -- Sometimes these explode

(8) The Dominator -- He takes over by habit

(9) Distractor -- Irrelevant and minor

(10) Manipulator -- Has personal axe to grind

(11) Belittler -- Ridicules other's ideas

g. Instructor summarizes points as completed. Instructor gives final summary and lists items learned at end of session.

6. Advantages

a. Provides for great student particpation

- b. Furnishes experience in organization and presentation of ideas.
- c. Stimulates student to think and reason out problems in his own manner rather than to follow thinking process of instructor.
- d. Develops leadership qualities.
- e. Encourages various points of view.
- f. Promotes group activity and responsibility.
- g. Creates high morals as a democratic process of expression.

7. Disadvantages
   - a. Usable only in certain subjects
   - b. Time consuming
   - c. More capable students may take over
   - d. Difficult to "control"

8. Other Discussion Groups
   - a. Panel -- discussion by a selected group with a leader in front of audience which joins in later; conversational exchange of ideas
   - b. Debate -- regulated discussion of a given proposition between two matched sides; no audience participation; winner is determined by judges
   - c. Forum -- An organized discussion by one or more experts who give their views before an audience, before the audience participates with questions and further discussion
   - d. Symposium -- Two or more competent speakers present different aspects of the same problem in prepared speeches

9. Summary

Personal contact between instructor and students is an essential part of any efficient educational program. Directed discussions provide adequately for student participation and furnish the instructor opportunity to give individual attention to each student. The instructor is in a position to find out how much the student has learned and to know when explanation and review are necessary. To be profitable, classes must be small (25 or less). Otherwise individual attention, the essence of this method is lost.

# PROBLEM-SOLVING METHODS[11]

English

Grades 7 - 12

I. The Problem-Solving Conference

- A. Personnel involved
  - 1. Chairman or leader
  - 2. Conferees (the class or the group)
  - 3. Recorder
- B. Physical arrangements
- C. Phases
  - 1. Phase One - The Approach (about 5 minutes)
    - a. Chairman is introduced or introduces himself.
    - b. Chairman puts conferees at ease.
    - c. Chairman explains conferences procedure and rules.
      - 1) Chairman will not act as an authority.
      - 2) Conferees will not be required to stand.
      - 3) Conferees will not be required to address the chair.
      - 4) What conferees say will be confidential.
      - 5) Friendly disagreements are welcome.
      - 6) Only one conferee will speak at a time.
      - 7) Participation is necessary for success.
      - 8) Time limit.
    - d. Chairman appoints a recorder (Note: The Chairman may act as a recorder or have made previous arrangements for a recorder).

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[11] *Ibid.*

   e. Chairman states the problem with emotional overtones.

   f. Chairman leads conferees to an accurate statement of the problem and then writes the problem on the chalkboard.

2. Phase Two - The Drawing Out (not more than one hour)

   a. Chairman asks an interest-arousing question to get the discussion started.

   b. Conferees discuss the problem analytically with adequate guidance and encouragement from the chairman.

   c. Chairman never gives personal opinions.

   d. Chairman rarely provides information.

   e. Chairman should watch for signs of overheated conflict.

   f. Recorder paraphrases and lists on the chalkboard each important ideas and each solution.

3. Phase Three - The Acceptance

   a. Chairman should employ "feed-back."

   b. Chairman should ask conferees to take a good look at the ideas or solutions presented.

   c. Chairman requests conferees to measure their solutions against the criteria of the following:

      1) Suitability

      2) Feasibility

      3) Acceptability

   d. Chairman requests conferees to combine any relation solutions.

   e. Chairman requests conferees to cancel repetitious solution with the consent of the contributor.

4. Phase Four - The Summation

   a. Recorder writes the group solution on the chalkboard.

   b. Chairman restates the problem.

   c. Chairman reviews the conference action.

   d. Chairman acknowledges the solution(s) arrived at by consensus. (Note: Voting operates to split the group into winners and losers.)

e. Chairman mentions any differing opinions that may have arisen.

f. Chairman thanks conferees.

## THE INCIDENT PROCESS METHOD OF TEACHING[12]

English Grades 7 - 12

(Times given are for a regular case running 1½ to more than 2½ hours, and for a demonstration case running about 45 minutes.)

PHASE 1: Studying the incident. (20 to 30 min.) (3 min.)

Each member studies the incident and asks himself "What's really happening here? How can I get to the bottom of it? What new facts do I need before I can get down to the issues?"

PHASE 2: Probing for facts. (20-30 min.) (8 min.)

Ask questions of the leader. What are the facts? Where is the key to the case? The observer-recorder records findings.

PHASE 3: Defining the issues. (10-15 min.) (5 min.)

What needs to be decided right now? Each member makes up his own mind and reports. The issues suggested are recorded. The group decides, through discussion and perhaps by voting, what the key issues are. . . . .what needs to be decided immediately.

PHASE 4: Making and testing immediate decisions. (60-75 min.) (20 min.)

Each member writes his decision and signs his paper. When all decisions have been received they are compared. If there are disagreements, as is usually the case, the group separates into separate groups holding similar beliefs. Each group consolidates its views and selects a spokesman to defend the group belief in a debate with spokesmen of the other groups. After the debates there is another check to see if any members of the group have changed their position. Can the entire group now agree on an immediate decision on the key issues?

PHASE 5: Looking ahead and looking around. (5 to 15 min.) (8 min.)

Now the leader will reveal any significant facts which were not requested. Do they change the case significantly? Now study the case and detect the roots of the difficulty. How can problems like this be prevented in the future? Are there likely to be other cases like it which have not yet come to light? Also look upward to the level of general ideas and valid principles. What basic policies are suggested?

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[12] *Ibid.*

(In systematic use of the Incident Process method with a group, several cases are studied so that each member of the group can serve as leader, as observer-reporter, and as one of the debaters.)

## THE CASE STUDY METHOD OF TEACHING[13]

English Grades 7 - 12

### I. Definition

The case study method is essentially an analytical study of real fact situations.

### II. Purpose

From a study and analysis of numerous cases involving similar but varying facts, a general or specific proposition or conclusion may be established and various and significant exceptions to the general conclusion developed. Having developed or analyzed solutions to other specific problems, one is able to intelligently apply these solutions to new situations in order to ascertain or predict logically what should be the outcome or result based on the facts presented. Furthermore, the case study method may be utilized to determine how to avoid or thwart effectively in the future a particular problem from arising.

### III. Points to Remember

It is important to remember a given solution or solutions to a definite and specific problem only apply to the set of facts embraced and included within the problem. While it is an extremely rare situation for two or more cases to involve idential facts, it is fairly commonplace for the primary issue of several cases or problems to be the same. That is why the case study method the facts as well as the solution are of equal importance. Without an understanding of each, the case study method cannot be effectively used.

### IV. Procedure

A. Factual material in the form of a record of a real fact situation is given to the class a day or so in advance of the actual discussion of the case.

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[13] Ibid.

B. Prior to class discussion of the case each student:

  1. Digests or briefs the case in his own words.

  2. Writes out what he considers to be the (prime issue).

  3. Writes out the principal conclusion of the case.

  4. Writes out the secondary issues and conclusions, if any.

  5. Writes out the meaning of the case.

C. The class analyzes the case by the discussion method. It discusses all aspects of the case.

D. During the course of the discussion of the case the instructor

  1. Directs or guides the course of the instruction; however, he must not be too arbitrary in directing the discussion and must keep an open mind to new ideas or approaches which he may have overlooked.

  2. He must develop or stimulate the student reciting and the listening class to probe the case to its ultimate depths. Although he must lead this probe, he must make the student feel he is doing the probling or finding the solution.

  3. He must not spoon feed.

  4. He provides additional background information as may or may not be needed.

  5. Finally at the end of the discussion of the case, he summarizes the findings of the class and points out the significance of the case and how it is related to the problem at hand.

V. Advantages

A. Encourages maximum class participation and is student centered.

B. Engenders critical attitude.

C. Develops and trains a student to THINK in an ANALYTICAL manner and to reject conclusions which have no foundations in fact.

D. Develops powers of evaluation, discrimination, insight reflection, and communication.

VI. Disadvantages

A. It cannot be effectively used to cover a broad field.

B. It takes time to orient the student to a new technique of thinking and some do not readily adapt to the change.

C. It requires the services of a good discussion leader who is not only an expert in the field but also able to stimulate the class and student thinking.

D. Time consuming.

E. Requires advanced detailed preparation by students which some may or may not have the time to do.

F. Errors of interpretation by the instructor are possible.

G. Errors in the collection of case material.

H. Not effective for classes over 35.

## PROBLEM SOLVING METHOD OF TEACHING[14]

English

Grades 7 - 12

A. Objectives:

1. To provide the student with a method of problem solving that can be applied to many situations.
2. To provide an opportunity for the student to use the problem solving method.

B. Outline of Instruction:

1. Basic steps in problem solving - This is primarily a method of thinking based on scientific procedures. The purpose is to prepare students to analyze problems systematically. One of the most important steps is to demonstrate a logical orderly procedure for evaluating the problem. To satisfy this requirement an approach, entitled the six column approach, is recommended as the accepted one. It has been found that usually this approach gives the best results. Notice that each column is headed by a title. These titles represent each phase in the problem solving process, viz:

| Facts | Problem | Possible Solutions | Consequences of possible solutions | Accepted Solutions | What was cause or causes of problem |
|---|---|---|---|---|---|
| | | | | | |

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[14] Ibid.

It is usually the best procedure to draw and title the **illustration** on the chalkboard and to make use of a chalkboard recorder -- the function of this person and others involved in the process will be discussed in group structuring. However, the chalkboard is usually the best recording device as it represents a ready visual reference.

a. Determination of facts - One of the most important steps in the problem solving method is to teach students to determine facts. All good objective reasoning is based on facts, things or events which actually occurred. Students often prone to interject assumptions, which are subjective and did not occur. In teaching the cases provided, insist that your students deal only with facts as outlined in the case, or if an assumption is accepted, make sure it is thus identified. After the students have read the case and the discussion opens, have your chalkboard, record under column I, those facts involved in the case as suggested by your students. Make sure you have gleaned all the pertinent facts, even if you must ask leading questions to get some not brought out by the discussion. Delay anything other than these facts until you reach that part of the process pertinent to the suggestion.

b. Definition of the problem - This element will be entered under column II by your recorder. The important impression to be left with your students in the definition phase, is that in any one human relation incident or any other problems there are usually two elements or problems - the immediate and the underlying. Most individuals can readily see the immediate problem, gear doesn't work, someone is in trouble, relationships are poor between people - these things are readily apparent - but what is the long range problem - what is beyond the obvious. The individual must face both problems - he can usually define the immediate but he must be trained to define the underlying difficulty. Insist that the problem be written on the blackboard -- . Do not accept a verbal definition. Make the class analyze this definition. The definition is mandatory in order to determine a course of action.

c. Possible courses of action - The good leader realizes that in any problem many possible courses of action for solution present themselves. Before attempting any possible course of action the good leader attempts to determine all the methods available to him for solution. In handling technical or human relation problems the prospective leader must be made concretely aware of the existence of many alternative solutions and fourth step determines to a large degree which one of the courses accepted in this phase or any combination thereof can be used in the solution of the problem. Remember in this phase we are not evaluating the courses, we are merely suggesting the alternatives for solution. Elements developed in this area are to be entered under column III.

d. Consequences of possible courses of action - No leader worthy of the name leaps to the solution of a problem without considering the consequences of all proposed solution. What will occur if I take this method in preference to another. This is the point where the leader somewhat uniquely places himself in a position no other individual can assume. In light of this the prospective leader must be made so aware of the importance of evaluation of consequences that with practice it will become second nature. Here the individual will consider the relative importance of each of the suggestions, as whatever solution is accepted in step five will involve an expenditure. The good leader considers this element and conserves both in order to obtain the most economical result. Much discussion should take place in this phase of the problem.

e. Solution of problem - In this step the students will accept one of the possible courses of action or a combination thereof as the solution of the problem. Do not fasten yourself to the mistaken belief that the solution must be 100% agreed upon. The opinion of the majority is adequate to determine the solution. The good leader who must assume the responsibility will rely upon a majority decision as an adequate one. In order that the group may move as a unit it is important that individuals be trained to accept the opinion of the majority. This element is entered under column V of the illustration.

f. Cause of the problem - As mentioned previously the solution of the immediate problem is important. Let us assume that you have solved the immediate problem; it no longer exists; what steps should you take now? The naive usually forgets the problem once solved. The well-informed leader now matured mentally to the point whereby he is thinking in terms of preventing recurrence if possible. This should be an intensive area of discussion. The development of insight to determine basic causes of problems is a critical attribute of good leadership. Good thinking in this area can assist fighting brush fires on recurring problems.

2. Group structuring - In order that the problem-solving may function adequately certain roles must be assumed by members of the class. For purposes of illustration the instructor may assume one or more of these roles, but as rapidly as possible the class members should assume the responsibility.

   a. Organization suggested

      (1) Chairman or moderator - The chairman of any group using the problem-solving method or any other group procedure is the key to the whole success of the problem. He holds the responsibility for the preparation and successful conduct of the group meeting. It is his responsibility to make a thorough analysis of the assignment, get information on the group members, locate resource material, prepare tentative agenda and above all also not to have a readymade solution for the problem. He must study the problem, set the stage, get the group to agree upon plan of attack, bring facts to bear on the problem to stimulate member contributions. The chairman frequently summarizes and refocuses attention to the problem. It is his responsibility to get a concensus and to conclude the meeting.

      (2) The role of the coordinator - The coordinator assists the chairman during the meeting and is responsible for the setting of the meeting. Among his responsibilities are

the physical setting, availability, distribution and storage of resources, maintenance of esprit de corps and to prevent retardation of group progress. He assists the chairman in keeping the discussion on in focus, on schedule and balances participation in the discussion (eliminates domination by one or a few members.)

(3) Group recorders - There are usually two recorders in any group process, the permanent and the blackboard recorder. The permanent recorder provides continuity, he is able to trace group action through a series of processes. He is responsible for recording the final chalkboard record, checking consistency of group consensus (very important in leadership), he points out conflict, reads the record for final approval and assists with the preparation of final reports. The chalkboard recorder must provide an assist to the permanent recorder by mirroring the wishes of the group, keeps running records and tentative conclusions, solid agreements, etc. He is expected to participate fully in the discussion. This individual should develop the ability to make rapid analysis of comments, use words effectively, explain relationships, and clarify comments of group members. A blackboard recorder must try to overcome several common difficulties: (1) he must overcome the inclination to "read in" meanings not intended by a contribution (2) he must overcome personal bias in interpreting contributions and (3) he is faced with mechanical difficulties of writing on the blackboard.

(4) The role of the observer - The general function of the observer is to evaluate the group process; he may, as an expert, play a central role in the evaluation or he may serve as an agent to collect data for group participation in evaluation.

(5) Participation by group members - The observer, coordinator, chalkboard recorder, and recorder should all be encouraged to participate as members of the group in addition to carrying out their special assignments.

3. Demonstration of problem solving method

a. Utilize the procedures as outlined in 1 and 2 above.

4. References: Haiman, F.S.: Group Leadership and Democratic Action New York: Houghton Mifflin Company

5. Suggestions for the Teacher

a. Do not spend more than 10-15 minutes discussing the basic principles and procedures of the problem-solving method. The majority of the session should be spent in the actual discussion of a problem by the members of the class in the form of a demonstration. Select a "problem" situation for demonstration purposes. The teacher should chair the first several discussions to allow the students to become familiar with process. Then in order to make the process more functional the instructor should turn the cases over to the members of the group and rotate the various group positions among the group. It is vital for the instructor to remember that this hour will acquaint the student with some of the most vital problems of leadership: (1) objective analysis of situations (2) the delegation of authority (3) utilization of available resources in handling problems and (4) knowledge and analysis of the students involved.

## READING AND RESEARCH UNIT ON BIBLIOGRAPHY

English Grades 7 - 12

The purpose of a bibliography is two-fold: (a) to give documentation and authority to the material covered; and (b) to provide additional sources of information for the reader. In the field of research extensive bibliographies have already been prepared for various areas and topics. These are collected in books devoted exclusively to bibliography and are usually catalogued according to subject.

A mere listing of sources (books, magazine articles, newspapers references, etc.) is of little value, however, unless some critical comment about each is included to aid the researcher in selecting material of particular value to him. This type of commenting is called annotation. An example of an annotated bibliography will be found in Morrison and Commager's The Growth of the American Republic.

For this exercise complete the following:

1. Check bibliographical references in encyclopedias and reference books such as Dictionary of American Biography or standard history books.

2. Compile annotated bibliographies on each of the topics listed including only works (magazines and books) in our library. Each topic should have a diversified listing including sections from larger works.

   A. A general topic which will give the reader a broad scope of the field. Works selected should include both general and specific information and slants.

   B. A bibliography concerning the life and times of an historical personality. The main emphasis should be placed on the person's main interest area; i.e. politics, economics, or military.

   C. A period bibliography will include more social and economic, and cultural items than the usual political items included in number two. Partial sections of larger works will be very useful here.

## READING AND RESEARCH UNIT ON BOOK REVIEWS

English Grades 7 - 12

One of the first steps to a critical understanding of historiography, the method of interpreting historical writing, is a periodic investigation of book reviews. Reviews of current publications in the field of history, especially those found in the professional journals (American Historical Review, Mississippi Valley Historical Review,) and many others relate the new trends and interpretations. There might be the developing of a new approach to a topic, the criticizing of an accepted theory (like the Turner Thesis), or a re-evaluating of personality contributions. The reviewer will usually summarize the content briefly and concentrate his attention on the style, approach, and emphasis of the author. For those who are unable to read even a fraction of the works published, (seventy books per year is considered prodigious reading) the book review becomes an invaluable source of information. It is obvious, however, that a scholar cannot substitute the book review for an actual reading of the text as a general rule.

For this exercise complete the following:

1. Look at some book reviews in the following publications: Saturday Review, New York Times Book Review Section, Atlantic, Harpers, Time, Newsweek, and the New Yorker.

2. Select one book in the field of history reviewed by at least two of them and write a short report comparing the reviews as to content, criticism, and over-all evaluation. At least one review must be from group A.

| Group A. | Group B |
|---|---|
| Saturday Review | Atlantic<br>Harpers |
| New York Times Book Review Section | Time<br>Newsweek<br>The New Yorker |

3. Suggest various uses of the reviews of this book in historical research.

Student submit book selection for approval. No duplicates to be allowed.

## READING AND RESEARCH UNIT ON ENCYCLOPEDIAS

English Grades 7 - 12

The basic quick-reference works for the historian are the encyclopedias and the dictionaries. Their contents range from general information to highly complex and specific data and have, correspondingly, an increase in difficulty of vocabulary and comprehension of material. The selection of material in any area for an encyclopedia depends on the ability level of the people it is to serve. It is important for a student of history to know which encyclopedias give the fullest account and maintain a high degree of respect for the details, while still containing summaries and analysis.

It is also important for us to know what material is considered basic (appears in all of the encyclopedias) and why such a selection was made. It is necessary to judge the effectiveness of each article by its use of pictures, statistical tables, sectioning of topics, etc. An invaluable piece of research would be accomplished if you could discover material out of date, superficial, or erroneous.

For this exercise do the following:

1. Compare your article in each of the encyclopedias listed below.

   Encyclopedia Britannica
   Collier's Encyclopedia
   The World Book
   The Encyclopedia Americana

2. Select those points that seem basic to each and tell why you think the choices are or are not sound.

3. Comment on various styles (use of quotations or authoritative accounts) and approaches to the subject.

4. Write a brief critical evaluation of each encyclopedia basing your comments on your research and a quick perusal of the volume in hand.

Students Article:

## READING AND RESEARCH UNIT ON MAP WORK

English Grades 7 - 12

Everyone is familar with an Atlas composed of maps showing political or geographical divisions. Of equal value to the historian are maps showing social, political, or economic distributions by states or countries. This information can also be expressed in graphs or charts, but the map has proved to be the most effective. This is especially true if the material in question can be compared over a period of time and the result of this comparison can show a cause and/or effect relationship to a historical movement.

For this exercise complete the following:

1. Investigate several atlases and list at least ten different types of maps giving the source for each one. Comment on the effectiveness of each to historical research.

2. Using the comparative information from a series of maps in Lord and Lord, write an essay on the topic, using only that information. A standard text may help to put the information in its proper setting.

Student's Topic:

## READING AND RESEARCH UNIT IN HISTORICAL FICTION

English Grades 7 - 12

A popular way of presenting history is through the historical novel. The setting is usually authentic and the events real, but a majority of the characters and the personal events of their lives are fictitious. Since fiction is supposed to penetrate the human personality more than non-fiction, the importance of historical fiction is the development of the prevailing social and cultural atmosphere of the time portrayed. Many authors of historical fiction have a keen sense for historical fact and their works stand as classics. Many of these have actually influenced the thinking during their time and today present for us an adequate, often vivid, picture of the period.

For this exercise complete the following:

1. Read sections of the historical fiction work below.

Note comments on or allusions to political, economic, social, cultural, military, etc. references.

2. Select any six items chosen from the book and check each item or prevailing condition in a standard reference work or non-fiction account.

3. Write an essay on the importance of historical fiction, especially the book you investigated.

Student's Book:

## READING AND RESEARCH UNIT ON SOCIAL STUDIES ISSUES

English | Grades 7 - 12

Your study of history has shown you that on many points there is no "right" opinion. Most issues are so complex that even the most objective evaluations of them are "colored" by the materials investigated, the researchers basic prejudices, and/or the influence of outside forces. The Amherst Series on "Problems in American Civilization" tries to aid the beginning student by collecting for him materials on "both sides" of important issues. Armed with a background of fact, the student can use this material in formulating his own impressions or in correcting erroneous assumptions.

In the beginning of each Amherst volume there is a page devoted to the "Issue." Quotations from both sides are given to assist the reader in clearly seeing what the problem is. The articles either support one side or the other or attempt some type of summary or analysis. The "Introduction" usually divides the articles into the above categories with some notation about each one.

For this exercise you will examine the Amherst Series indicated by:

1. Reading the Introduction: and examining the basic issue.

2. Reading each article and giving excerpts from it to clearly indicate the position of the author. Indicate the strength of each article to the side of the issue involved.

3. Writing an essay giving your beliefs as to which side presented the best case and why.

Student's Amherst Series:

## READING AND RESEARCH UNIT ON RESEARCH QUESTIONS

English Grades 7 - 12

Not all historical research is an investigation of broad topics or general themes. It is often necessary in the course of your investigations to trace some detail of information and often the only way to find the answer is to "dig" in the reference books.

Standard reference works range from encyclopedias and dictionaries to specific works on names, dates, countries, professions, etc. Not all libraries have every reference book available and many of the more detailed ones are of only limited value, but it is necessary to develop an understanding as to where to begin looking for the desired information. A student can become quite competent in handling most questions after a series of research exercises in various reference works.

For this exercise find the answers to the following questions. Remember, the information itself is not the significant thing. We are trying to develop a systematic research technique.

Student's Research Questions:

## READING AND RESEARCH UNIT ON OBJECTIVE WRITING

English Grades 7 - 12

Few historical events or personalities are so stereotyped that interpretatior concerning them are not continually being revised as new research is done and new evidence uncovered. Frequently, however, a prejudiced view can be so long in vogue that it eventually becomes accepted as historic fact and often generations of students are mislead in their search for truth. To write history objectively is a difficult task because every author will have certain elements in his background or in his study which effect his thesis. The writing of a textbook is even more difficult because objective writing is imperative whereas an individual work can take on the prejudices of the author and the reader can or should realize this in advance.

For this exercise you are to:

1. Examine a subject as treated in several general texts and more definitive works. Comment on those points which seem to be treated in the same manner in each case.

2. Note differences in amount of words devoted to various phases of your topic.

3. Quote in full items that appear in the works cited which seem to contain differences in basic facts, treatment, and interpretations.
4. Conclude this research exercise with an essay on the objectivity in writing an historical text and document it with information you have recently uncovered.

Student's Topic:

## GOALS OF CRITICAL THINKING[15]

1. Attitudes
    a. Tolerance
    b. Courage
    c. Objectivity
    d. Skepticism
    e. World understanding
    f. Responsibility for improvement of environment
    g. Consumer effectiveness
    h. Vocational competence
    i. Moral responsibility
    j. Devotion to truth
    k. Respect for excellence
    l. Spiritual enrichment
2. Skills
    a. 7th grade
        (1) Distinguishing between fact and opinion

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[15] The Western New York Study Council, Critical Thinking Through Language Arts, (University of Buffalo, 1961), pp. 1-2.

    (2) Distinguishing between relevant and irrelevant facts
    (3) Detect loaded words and slanted materials
- b. 8th grades
    - (1) Examining conclusions for sufficient evidence
    - (2) Recognizing assumptions - use and limitation of assumptions
    - (3) Recognizing generalizations; examining to determine if they are supported by sufficient examples
    - (4) Recognizing stereotypes in reading
- c. 9th grades
    - (1) Identifying the various propaganda devices when encountered in reading or listening
    - (2) Understanding the nature of logical proof - inductive, deductive
    - (3) Examining the use of authority in reading and writing; biased and unbiased authority; qualified and unqualified authority
- d. 10th grades
    - (1) Evaluating reliability of sources
    - (2) Understanding kinds and nature of evidence
    - (3) Differentiating between observation, judgment, inference
    - (4) Distinguishing between relevant and irrelevant data
- e. 11th grades
    - (1) Distinguishing between inductive and deductive reasoning
    - (2) Understanding the nature of syllogistic reasoning
    - (3) Learning the rudiments of non-Aristotelian logic
- f. 12th grades
    - (1) Learning to develop the common logic fallacies
        - (a) Post hoc
        - (b) Hasty generalization

        - (c) False dichotomy; black and white fallacy
        - (d) Begging the question
        - (e) Reasoning in a circle

3. Desired outcomes
    - a. Clear thinking
    - b. Attentive listening
    - c. Confidence in speaking
    - d. Physical expression
    - e. Thoughtful reading
        - (1) Pupils should recognize elements common to all arts.
        - (2) Pupils should relate what they read to their own experience.
        - (3) Pupils should read with perception.
        - (4) Teachers must open up the pleasure of reading.

## DISCUSSION QUESTIONS ON CRITICAL THINKING[16]

Language Arts

1. What is thinking?
2. What is reading? speaking? listening?
3. What is fact? What is opinion?
4. What is evidence? What is the relation of evidence to fact and opinion?
5. What is an assumption?
6. When is an idea or fact relevant to a situation?
7. What is a generalization?
8. What is propaganda? List some propaganda devices.
9. Describe the steps in deductive reasoning.

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[16] *Ibid.*, pp. 2-3

10. Describe the steps in deductive reasoning.

11. What do we usually mean by an authority on a subject? A qualified or unqualified authority? A biased or unbiased authority?

12. Discuss the factors which would determine reliability of a statement or idea.

13. Examine the empirical method of reasoning.

14. Examine the pragmatic method of reasoning.

15. Examine the analogy and its purpose.

16. What is an observation?

17. What is a judgment?

18. What is an inference?

19. How are observation, judgment and inference related in critical thought?

20. Study the syllogism, the parts and their relationships as they direct to a true conclusion. Observe the result of errors in syllogistic form.

Guide a discussion to create an awareness in the student's mind of the vital need for critical reading.

1. For many years people believed the sun moved around the earth. How has science shown us that this was a wrong idea?

2. Should anyone pay for a diamond because the stone is said to be a genuine diamond, or should he have an expert decide?

3. Has a fellow-student ever challenged a statement in a report you made through research? Were they ever right?

4. Why do newspapers publish apologies?

5. Are advertisements always accurate?

6. Do all newspapers discuss an event or an issue the same way?

7. How can we know when to believe what we read?

Foster the recognition of the difference between fact and opinion.

1. Thomas Jefferson was the greatest statesman we have ever had.

2. Franklin D. Roosevelt said, "We have nothing to fear but fear itself."

3. No one can reach the top in an industry without college training.

4. Here's the cookbook women have wanted for seventy-five years.

5. There's nothing like Dristan.

## RECOGNITION OF SLANTED WRITING[17]

Language Arts

1. When you have purchased this set of encyclopedias, watch your child's marks improve.

2. Have the student find examples to show how the wording of headlines indicates an opinion by the use of selected words or emotional language.

3. Have the students bring in examples to show how wording of a headline indicates an opinion by the omission of certain words.

4. Examine Time Magazine covers (Artists often convey biased ideas through caricature.)

## EVALUATING THE VALIDITY OF A STATEMENT[18]

Language Arts

1. How can the date of publication affect the accuracy of a statement? "There is no known preventive medicine for polio."

2. Why would you be careful to check the date of the source of your information on the following topics:

   a. The population of your city.

   b. Number of T.V. sets in the United States.

3. How can we be sure that the author of a statement is qualified to make it? Which of the following would most likely be considered an "authority" on the Constitution because of his position?

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[17] Ibid., p. 3.

[18] Ibid., p. 4.

   a. News commentator.

   b. Mayor of a small town.

   c. Supreme Court judge

4. Is sufficient evidence given to make the statement accurate?

   a. Why would you argue with the following statements?

      (1) He will make a fine president because he is so popular with the people.

      (2) We shall soon reach the moon. By 1980 we shall have round trip travel to the moon.

5. Developing accurate judgment.

   a. Which thing doesn't fit George Washington's time?

      (1) Mrs. Post looked at the articles for sale on the first floor of the shop. Then she got on the elevator and went to the second floor to buy a vacuum cleaner.

## DISTINGUISHING BETWEEN RELEVANT AND IRRELEVANT FACTS[19]

Language Arts

1. Read a selection for the answer to a specific question.
2. Examine materials in reference books to find material to answer specific question only. Do not allow irrelevant material.
3. Have children write telegrams which should include relevant and not irrelevant facts.
4. Conduct a class discussion in which students discuss facts needed by -
   a. A doctor who is called to the scene of an accident
   b. A carpenter to build a house
   c. A grocer who must re-order supplies
5. Without prior notice have two witnesses (students) to an accident

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[19] *Ibid.*, p. 4 .

or other dramatic event; give their version of what happened. Each witness should leave room while other is speaking. Have class members take notes - Relevant and irrelevant facts on two versions of the incident, noting facts, conjectures, areas of agreement and disagreement.

Prevent incorrect interpretation of material read.

1. Discuss figures of speech.
    - a. His speech brought the house down.
    - b. Some people have chips on their shoulders.
    - c. Andy held his tongue when he was teased.
    - d. Your father works hard to keep the wolf from the door.
    - e. He purchased the bike for a song.
2. Discuss humorous passages in writing so the students do not take the message seriously.
3. Discuss metaphors.

    Example:

    Give one sentence in which one word suggests a likeness to another object.

    Answer

    Airplane 1. The hummingbird warmed up its tiny motor.

    Baby 2. The wind finally cried itself to sleep.
4. Discuss analogies.
    - a. Lead is to pencil as ink is to pen.
    - b. Chapter is to book as act is to play.
    - c. Caterpillar is to butterfly as tadpole is to frog.
    - d. Lavender is to purple as pink is to red.

I. Introductory Activities

A. Display clippings to illustrate types of thinking.

B. Use film strips on propaganda devices to motivate student.

C. Utilize areas in orienting the unit.

1. What is reading?

   a. Answer: Thorndike's classic analysis of reading is, "Reading is reasoning"

2. A kind of thinking and reasoning known as critical thinking.

   a. Two directions for critical thinking
      analysis
      synthesis

   b. John Dewey's definition of critical thinking - "Active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and further conclusions to which it tends . . . " It is what is called critical thinking, not critical in the sense of being carping, adverse, cynical, negative, destructive, but in the sense of being judicious.

3. Two general classifications of reasoning are:

   a. Inductive - in + duco Lat. "to lead into" a generalization
      Inductive reasoning proceeds from the specific to the general

   b. Deductive - de + duco Lat. "to lead down from" a major premise
      Deductive reasoning proceeds from the general to the specific

4. The process of critical thinking.

   a. Anxiety - growing in intensity from need or interest (I feel this difficulty and perceive how it relates to what I already know.)

   b. Definition - decide what problem to pursue and how (Is this my problem? Shall I solve it alone or with others? What do I need to help me learn?)

   c. Research - Carry out research - experimentation (I read, listen, manipulate equipment and symbols, travel and talk.)

   d. Hypothesis - Hypothesize in light of new evidence. (I discuss or write about findings.)

   e. Appraisal - Appraise findings in the light of future needs. (I consider where my hypothesis fits in past and future learning.)

   f. Judgment - Make a personal judgment with a commitment to action. (I ought to do this and I will do it.)

5. Give students an opportunity to think by remembering to ask such questions as:

  - a. What is your evidence for that statement?
  - b. May new ideas have been discovered since the book was written?
  - c. How do you know that it is a true story?
  - d. What has been said on the other side of the question?

II. Developmental and Culminating Activities for Grades 7 - 12

A. Parliamentary Procedure

1. Construct a chart for ready reference in your notebook, showing the classification of motions (main, subsidiary, incidental, privileged), their order of precedence, those that may be debated, those that may be amended, those that are in order when another is on the floor, those that do not need a second, and those that need a two-thirds vote.
2. Have class meet as a temporary group, elect officers, draw up plans for organizing itself into a permanent club. Have class continue meeting from day to day until the constitution has been written by a committee and presented to the club and adopted, after which time permanent officers are elected. After the club is organized, have drill or practice in using the different kinds of motions:
   - a. The previous question is a subsidiary motion.
   - b. To lay on the table is a subsidiary motion.
   - c. A point of order is an incidental motion.
   - d. To fix time for the next meeting is a privileged motion.
   - e. Any independent matter of business before the meeting is a main motion. (there are others.)
3. Watch one of the following films and make a list of items you learn from it that will be valuable to you personally.
   - a. PARLIAMENTARY PROCEDURE (Coronet Films)
   - b. PARLIAMENTARY PROCEDURE IN ACTION (Coronet Films)
   - c. HOW TO CONDUCT A MEETING ( U.S. Department of Agriculture)
   - d. CONDUCTING A MEETING (Young America Films)

B. Panel Discussions

1. Select a problem that concerns high school students, such as:
   - a. Financing the school annual

b. Arranging school dances

c. Buying uniforms for the school band

d. Making trips to debate contests

Suggested procedure: Divide the class into small groups and have each group organize itself into a committee and elect a chairman. Each committee will then consider the problem and what should be done about it. When the class reassembles as a whole, each chairman will report the recommendations of his committee, and the class will decide which report seems to offer the best solution to the problem.

Let the class select a topic that requires investigation, such as:

(1) Taxation

(2) Aid to foreign countries

(3) Atomic power

(4) Soil conservation

(5) Youth recreation centers

2. Prepare panel discussions on some of the following:

a. Television programs

b. Social activities

c. Good colleges

d. Ownership of cars and "hot rods"

e. Good school citizens

Suggested procedure: The chairman for each topic should plan his panel discussion with care, hold preliminary meetings with other panel members to outline points to be covered.

3. Hold a cooperative investigation on magazines of today. Each class member will prepare to discuss a different magazine.

a. Its format

b. The type of material it contains

c. The kind of advertising it carries

d. The class of people who read it

4. Prepare a panel discussion on new books suitable for high school students to read. Be sure that all have read the books being discussed.

5. Organize a symposium on one of the following topics: (Select the various phases that ought to be discussed, and secure a speaker for each one:)

    a. Improving the school paper

    b. Getting better community support at athletic events

    c. Aiding high school students to secure work

    d. America's stake in world affairs

6. Evaluate one or more of the following films and make a list of items learned from them that you can use personally in group discussion:

    a. ARE YOU A GOOD CITIZEN?

    b. COMMUNITY GOVERNMENTS: HOW THEY FUNCTION.

    c. DISCUSSION IN DEMOCRACY

C. Debate

1. Bring to class three subjects taken from editorials in current magazines or newspapers which suggest good subjects for debate.

2. Write out three carefully phrased propositions that meet the five tests of a good debate question. (those five are: question should be interesting, timely, important; should be debatable; should have one unmistakable meaning; should allow affirmative to advocate the proposed change; should be phrased into a formal proposition.)

3. Hand in definitions of each of the terms in the following propositions:

    a. The study of science should be compulsory in high school.

    b. Every high school student should study typing.

    c. Hot-rod driving should be prohibited by law in our state.

    d. There should be no summer vacations in our educational systems.

4. Select a proposition for special study and after adequate investigation write out what seems to be the issues. After you have done this, phrase each issue in the form of a question so worded that to each question the affirmative will answer YES and the negative will answer NO.

5. Select a question of current discussion in newspapers or magazines, or from radio or television programs. Prepare a written statement of why the subject is up for discussion, and of the opinion held by persons supporting each side of the question.

6. Secure five examples of argument from newspapers. Classify each according to its type of reasoning.

7. Analyze three editorials as to the different types of arguments that are used in them.

8. Find examples of as many different kinds of reasoning as possible.

9. Read all the editorials in one issue of your daily paper and of your high school paper. Test each for soundness of argument. If they are fallacious, classify the kind of fallacy involved.

10. Write a "guest editorial" for school paper.

11. Prepare a speech on the crucial points on one of these topics:

    a. Selling a television set

    b. Getting off early for work

    c. Convincing a classmate that he should go to college

12. Apply definition to proposition:

    a. State the formal wording of the proposition.

    b. Tell how the present interest in the question arose.

    c. Define each of the essential terms in the proposition.

    d. Restate what the proposition means in the light of the above background.

13. Apply analysis to proposition:

    a. State what the proposition really means.

    b. Set forth the affirmative contentions, the negative contentions, and the issues.

    c. State precisely the points that you intend to discuss.

14. Form debate:

    a. Divide the class into teams of two or three and let each pair of teams select a proposition for debate.

    b. Each team will prepare a bibliography and a brief.

c. Each team will then prepare a case and work out refutation for opposing arguments.

d. Debates will then be held in class one or two during each period, until the entire series have been given.

e. For each debate one student will serve as chairman and another as timekeeper; audience members of the class will hand in shift-of-opinion ballots after each debate.

15. Watch the following films and make a list of items learned from them that will be useful to you personally in the following ways: (finding information, thinking straight, detecting propaganda, arguing effectively)

    a. HOW TO JUDGE FACTS (Coronet Films)

    b. FIND THE INFORMATION (Coronet Films)

    c. HOW TO JUDGE AUTHORITIES (Coronet Films)

    d. HOW TO THINK (Coronet Films)

    e. LEARN TO ARGUE EFFECTIVELY (Coronet Films)

    f. PROPAGANDA TECHNIQUES (Coronet Films)

    g. HOW TO TELL THE DIFFERENCE BETWEEN ESSENTIALS AND DETAILS. (Society for Visual Education)

    h. HOW TO TELL THE DIFFERENCE BETWEEN FACTS AND OPINION (Society for Visual Education)

    i. INFORMATION, PERSUASION, PROPAGANDA (Society for Visual Education)

D. Reporting Plays

1. Jot down the titles of plays you have seen on the stage; name the plays in which you have taken part; tell what part you took or how you helped with the production. In class, with the teacher, go quickly over these lists in order that you may all know the plays with which the group is familiar.

2. Which do you attend more often, plays or motion pictures? Why? Critical thinking may arise from discussion from these questions:

    a. What has the playwright attempted to do?

    b. How far has he succeeded in his aim?

    c. If he failed in his aim, what are the causes of his failure?

3. What does the audience contribute?

4. Read one or more plays by writers of the past and prepare to discuss orally the aims of the playwright. The following list may be helpful:

   a. Aeschylus
   b. Euripides
   c. Aristophanes
   d. William Shakespeare
   e. Moliere
   f. Oliver Goldsmith
   g. Richard B. Sheridan
   h. Henrik Ibsen
   i. Edmond Rostund

5. Read dramatic criticism by John Corbin, Alexander Woolcott, John Mason Brown, others. Read The Theatre Arts Monthly, bring newspaper clippings to class and be prepared to answer questions such as:

   a. What impresses the critic?
   b. What points does he discuss?
   c. What references are there to specific parts of the play?
   d. What statements seem to you to be meaningless?
   e. Which comments seem to you to be true?

6. From the clippings you have brought to class select statements that reveal the writer's personality.

7. Write a review of a play. If possible attend a play with the purpose of writing the review for a newspaper.

Reporting Speeches and Interviews

1. Make a study of at least one speaker who is scheduled to appear in your school assembly or some other civic or public function.

2. Read critically selected accounts from the New York Times, then orally discuss them.

3. Comment on the vocabulary. Where was it necessary for the reporter to explain his use of terms?

4. Discuss the following:

   a. People do enjoy the T.V. programs because there are new programs every night.
   b. A stock is selling at a low price; therefore, it is cheap.

c. He had traveled about Europe and the United States, and he knew what he was talking about.

d. Interview one of the following:

(1) A junior who spent the summer in a foreign country.

(2) The captain of a freighter, who is spending a day in your city.

(3) An athlete just after a game or a meet in which he starred.

F. Conversation

1. Report orally an interesting conversation. It is difficult to report the words and to watch the personality of speakers, but make an attempt to do so. Try to point out what made the conversation interesting.

2. In conversing you naturally use less formal speech than in making a report or in giving a lecture. Explain and illustrate the following:

a. What does colloquial mean?

b. Give examples of colloquial words.

c. Make a list of twenty-five expressions containing five words which can be substituted for each of the following: (Consider the whole phrase, for the context is important)

awful mad lots fine terrible

3. Discuss small talk.

4. List the outstanding writers of humorous verse today. Who wrote it in the past?

G. Discussing and Reviewing Books

1. Show orally by as many examples as possible how people whom you know depend on books.

2. Bring to class as many guides for reading as you are able to find. Talk on their usefulness. (See publications by National Council of English Teachers and list in Educational Magazines as well as in other sources.)

3. Searching for a good book is somewhat similar to a treasure hunt. How have you found such books? . . . through friends, radio talks, books in the home, book reviews, librarians, advertisements, etc. Illustrate by naming the books that you have found and by telling what made you think that they would be interesting. Write your account thoughtfully.

4. In an interesting paper tell what books you would take to a desert island with you.

5. Write a single review or a series of reviews of books recently acquired by your school library.

## H. Having Opinions and Expressing Them

1. Should I go to camp this summer?

2. Should I learn to typewrite?

3. Should I go to a private school?

4. Should I enter college or a business school?

5. In writing, express clearly *your* opinion. Go into detail in the explanation, if possible give examples to make your point evident.

   Ideas:

   a. "A foolish consistency is the hobgoblin of little minds."
   R. W. Emerson

   b. The most effective knowledge is gained in a casual manner.

6. Write a paragraph expressing your solution of a problem where there are conflicting loyalties: family, club, race, religion, politics, friendship, obligation.

7. Write to the "Institute for Propaganda Analysis," New York, for information about propaganda.

8. Listen to an address over radio or television on politics or current affairs. Point out passages with emphasis on clear thinking. Report emotional appeals. Call attention to the merits or the defects of the address.

9. *Washington's Fairwell Address to the People of the United States* was an open letter published in September 1796, in the *American Daily Advertiser*. Read the address and report on it in writing.

10. Discuss thoughtfully in writing: "Why I should (should not) like to enter politics."

11. Write a criticism of an art exhibition of the work of pupils in your school. (read articles in *Harper's Magazine*, *Scribner's Magazine*, *Atlantic Monthly*)

## I. Exploring the Dictionary

1. For data notice such points as:

   a. Spelling

    b. Syllabication

    c. Pronunciation

    d. Inflection (Irregular plurals, etc)

    e. Derivation

    f. Status (such labels as Obs. Colloq. Dialect. Etc.)

    g. Snynonyms and antonyms

    h. Special uses

2. Inspect the book Picturesque Word Origins, published by G. C. Merriam Company. Select one word and report it to the class.

3. Choose some personage whose life interests you. Read the accounts and the The Century Dictionary and Cyclopedia. Are these reports more complete than those to be found in an unabridged dictionary? Compare these accounts with those to be found in Encyclopedia Britannica, The New International Encyclopedia and the The Americana.

4. Examine the World Almanac. Report to the class five interesting facts which you learned from it. (notice vocabulary.)

J. Planning Good Composition

1. Select the topic

2. Develop the topic

    a. It must be clear

    b. It must be logical

    c. It must be unified

    d. It must be coherent

3. Treat the factual topic, which calls for a knowledge of the background, with facts, references, illustrations, reasons, results, comparisons, etc.

4. Treat the personal topic in such a way that it shows power of sensitive description; it requires the gift of the imagination.

5. Comment on the development which is aided by the proper use of transitions. Are they natural? Varied? Clear in reference?

6. Realize the introductions should serve three purposes:

    a. To arouse the reader's interest.

b. To set the "tone" or define the writer's attitude toward his topic.

c. To introduce the argument or give a preview of the writer's thesis.

7. Consider that the close of the composition should sustain the "tone" initiated in the introductory paragraph. It may repeat the main point in dramatic form; it may summarize; it may come to a natural climatic end; it may end with a reflection, a humorous remark, a quotation.

8. Careful attention given to sentence structure, spelling, vocabulary, grammar of common usage, punctuation in ordinary usage.

9. Give students occasional exercises in "balancing the books," e.g. propose the problem of a student who wonders whether he should take a job after school hours; make needed assumptions; line up in parallel columns the arguments pro and con; reach a conclusion.

10. Write on the board such a sentence as "Saturday was for me an unusually busy day," and help the class develop it into a paragraph. Thus the students see the need for a topic sentence and for interesting details.

11. Have students jot down their ideas for themes in a part of their notebooks reserved for that purpose.

12. Have each student write a paragraph or two explaining to a "greenhorn" how to perform a simple task that can be demonstrated in class, e.g. how to tie a shoelace or how to put on lipstick. The student reads his paper slowly while a volunteer "greenhorn" attempts to follow instructions, being careful not to do anything not included. If the instructions are not adequate, they must be revised.

K. Letter Writing

(Clear, direct letters as well as imaginative stories demand work. They do not come easily.)

1. Write a letter of application for a position as a counselor to the director of a camp. In this letter give your ideas on the value of camping.

2. Write a letter to the admissions officer of a college explaining the reason for wishing to attend college, or to the admissions officer of some professional school explaining the reason for deciding to attend.

3. Write a letter for an Americanism contest in which you tell why you are proud and happy to be an American.

4. Write letters to classmates, teachers, principals for their views on one of the following topics:

   a. Should homework be abolished?

   b. Should comic books be banned?

   c. Should teenagers be given a regular allowance?

   (After replies are received, discuss the opinions through debate or panel discussion.)

5. Write to pen-pals for exchange of information on language, habits, customs, schools, etc.

## Teaching Grammar[20]

1. Use the inductive approach which allows the student to develop a clear concept by discovery of a generalization the study of many specific illustrations. Example:

   a. John runs.

   b. Mary walks.

   c. The wind blows.

2. Ask to these simple statements, questions how, when, where, why, degree of how far, how much. Suggest good words for answers to be adverbs. Point out relationship of adverb to verb, adjective or other adverb. Arrive at concept that words which answer the above questions to verbs, adjectives or other adverbs are called adverbs. This form of reasoning can be used to develop other grammar concepts.

## Teaching Note-Taking[21]

1. Have teacher and class take notes on assembly address. The teacher after mimeographing hers, compares hers with students'. This will help to point out that everything said should not be written down. OR suggest they write down what they believe to be the theme of the speech and each of the chief supporting ideas.

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[20] *Ibid.*, p. 14.

[21] *Ibid.*, p. 14.

2. Question the speaker's statement of opinion and possibly his facts. Seek parallel incidents from life or literature. Supply examples. Supply contrasts; Example . . . What would Hamlet do if an enemy army invaded Denmark? What would Wordsworth do if he were living today and were told that he had to spend the rest of his life in New York City?

## Teaching Listening[22]

(In listening to learn, you use your power to think.)

1. Listen for the main idea, rather than clutter your mind with a lot of unrelated details. If not there, phrase the main idea yourself.

2. Listen for the subordinate ideas that amplify and clarify the principle idea.

3. Determine the organizing principle and the structure of the whole. Is it chronological, spatial, topical or inductive?

4. Relate what is new to what you already know. How does it modify or expand your previous conceptions and assumptions?

5. Apply to the speaker's statements the same criteria and tests that you have learned to apply to your own. Is the statement verifiable? Is it an observational statement or does it include inferences and judgments? Is the speaker himself qualified as an observer or an authority? What of the qualifications of those whose testimony he uses? Be sure you know what the speaker means; however, before passing judgment on the reliability of what he said, ask yourself how you can make use of the information you acquired.

6. Discuss the why and how of listening.

    a. Courtesy

    b. Purposefulness

    c. Accuracy

    d. Responsiveness

7. Have volunteer committee construct a poster naming and illustrating qualities of a good listener. Could be cartoon pointing up faulty listening habits.

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[22] _Ibid._, pp. 14-15

8. Before playing a record, teacher suggests that students listen for something in particular.

9. In an oral presentation explaining how to make things, teacher first asks class to try to follow each explanation and be ready to ask questions if there were something they did not understand.

10. Divide class into groups each listening for a different point.

    a. Group 1 - new ideas

    b. Group 2 - familar ideas

    c. Group 3 - effective ways used by speaker to hold attention

    d. Group 4 - speaker's plan of organization

    e. Group 5 - quotable phrases or sentences

    f. Group 6 - unsupported generalizations

    g. Group 7 - clues to questions to be raised in discussion period.

Each group has a spokesman who, after five minutes sharing with the group whatever was heard, shares his information in a general discussion. This procedure will help entire class to see what can be done in purposeful listening.

## Teaching Literature[23]

1. Requires student to analyze material before he can correctly answer the question or discuss the problem.

2. Includes the meaning of "classic."

3. Includes knowing how to discuss or evaluate a good book.

    a. Theme - What is the book about?

    b. Style - Is the writing easily understood?

    c. Setting - Where does the action take place?

    d. Characterization - Are these real people?

    e. Story - Does it hold your interest?

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[23] *Ibid.*, pp. 15-16

f. Drama - Do the action and dialogue fit together?

g. Author - What are his biographical details?

h. Miscellaneous - Does the book inspire you to agreement or disagreement? Does it remind you of something else you have read?

4. Requires knowing the difference between prose and poetry.

5. Requires knowing the difference between fiction and non-fiction.

6. Helps students formulate a credo about loyalty to his country, friendship, religion, family life, war and democracy through the following activities:

    a. Read an open-end story, one that lends itself to different interpretations.

    b. Allow student to write a theme answering the problem of the story, read some answers to the class.

    c. Discuss what causes each one to have a slightly different definition of term; consequently, the differentiated personality of each student comes into focus.

    d. Follow with theme or discussion allowing students to examine own beliefs suggesting the following questions:

        (1) What do I believe about loyalty to my country?

7. Ask frequently questions involving reflective thought; pointed questions that guide thinking, like "Besides the love of nature, what qualities do these two poems by Robert Frost and William Wordsworth have in common?"

8. Adapt thought questions to the level of the class.

## Teaching Students to Reason[24]

1. Select a question of current discussion in newspapers or magazines or from radio or television programs. Prepare a written statement of why the subject is up for discussion, and of the opinion held by persons supporting each side of the question.

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[24] Ibid., pp. 16 - 18.

2. Secure five examples of argument from newspapers. Classify each according to its type of reasoning.

3. Find examples of as many different kinds of reasoning as possible.

4. Give attention to the several ways to reason logically. You may reason by Syllogism (a brief form consisting of three short sentences into which an argument from the general to the particular) a deductive argument cast in order to present it in outline or test its soundness. The first two sentences are called premises; the major and the minor. The major premise covers a class or type; an example, Every virtue is laudable. The minor premise covers a specific instance; example, Kindness is a virtue. Both of which premises lead to a conclusion; Kindness is laudable.

   You may reason by elimination. You may want to go to college which offers courses in modern architecture. You study the catalogues and discover that there are four colleges A, B, C, and D --- offering such cources. You have eliminated all the rest. Suppose all these colleges appear equally good. Then you put in another factor which will eliminate some: "It must be near my parent's home" this eliminates C and D. Then suppose you add one more factor: "It must be one I can afford to attend." This eliminates B. You have the argument: "I want to go to college which has courses in modern architecture, which is near my parents' home and which I can afford to attend." College A is the one to choose. You may also study many facts and come to a general conclusion about the relationship or conditions existing among these facts. Study the uses of the comma, for example.

5. Be able to test the kind of proof frequently offered by writers and speakers:

   a. What assumptions does the writer make?

   b. What evidence does he offer for each assumption? Is it good?

   c. List the argument he uses to prove his conclusion.

   d. Do you think his final conclusion is sound?

6. Bring to class an advertisement. Consider the following advertisement, for example: Would you buy the medicine the next time you have a cold? Check the assumptions and the facts. What kind of proof does the writer use? (Find an advertisement concerning colds.)

7. Read through newspapers and magazines, you will find a number of different kinds of discussions in both editorials and news stories. Some will have adequate proof; some will make broad, bold assumptions without proof; some will rely upon factual material; some will present good evidence, and some will present evidence which is either distorted or insufficient. These are factors which you must consider before drawing your conclusions. (This activity is very good for group participation in Critical Thinking.)

8. Try to analyze your own beliefs, needs, prejudices, and emotions that were involved when some persuasive force was brought to bear on you. What part did logical reasoning play? What methods and techniques of persuasion affected you? Apply your analysis to one or more of the following:

    a. Why I work hard for one teacher.

    b. When I "followed the crowd."

    c. Why I bought something I did not want.

    d. Why I began smoking.

    e. Why I watch my favorite T. V. program.

    f. Why does a particular teacher hold or lose my attention?

    g. What moves me to do my best?

9. Newspaper

    a. Be able to read with some discrimination and judgment.

    b. Know how news is gathered.

        (1) By staff reporters

        (2) By free lance writers

        (3) By columnists

        (4) By foreign and special correspondents

        (5) By news agencies

    c. Scan the front page; read headlines, subheads and leads. Read first page of the second section.

    d. Read columns of news analyists.

    e. Read reviews of latest books, motion pictures, concerts, art shows, etc.

    f. Read matters of personal interest. (sports, business)

    g. Know terms:

        (1) News . . .

            (a) Spot news of immediate importance

            (b) Time news of secondary importance

        (2) Editorial

(3) A feature or human interest story

(4) The lead editorial

(5) Syndicated material

(6) A column

(7) Copy

(8) Slanting . . . distorting items so as to present a biased opinion

Teaching Pupils to Judge a Newspaper[25]

1. How wide and complete is its coverage?

2. Is it impartial and fair, printing both sides of an issue?

3. Is it decent, or does it stress sensationalism?

4. Does it respect the rights of individuals?

5. Is it clear, readable, interesting?

6. Does it show a sense of civic responsibility?

7. Does it withhold or suppress news?

8. Is it mechanically well printed and attractively laid out?

h. Know the value of a newspaper article. It is invariably given in the first paragraph or lead of the article itself. Source may be:

   (1) A statement by an official

   (2) An eye-witness

   (3) An official document

   (4) A public speech

   (5) A rumor

i. Know the meaning of propaganda. (Read the complete speech of a famous person and see how several newspapers reported it.)

j. Make an analysis of your family newspaper. On a sheet of paper, write the appropriate heading: (local, national or international) editorials, advertising and features. Count the column inches for each type of material. Complete the percentage for each to determine its part of the total content. Is a newspaper more than news?

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[25] Ibid., pp. 18-19.

k. Read a newspaper review and then try to use the same technique in reporting on a book you read or a motion picture you have seen.

l. Try to determine the political preference of a newspaper from its editorials, columns, etc.

m. Study the contents of the editorial page of a representative newspaper and answer the following questions:

   (1) How does the editorial page of a newspaper differ from other pages?

   (2) How is the editorial page related to the news pages?

   (3) For what class of reader is it intended?

   (4) What points of view do the editorials represent?

   (5) How do the columnists make up, in a way, for the loss of the great personal editorial writers of the past?

n. Read an editorial that is based upon current news interest in the present issue or a previous issue. How does editorial treatment differ from news treatment?

o. How should you read the sports section?

p. Classify the comics appearing in your paper under the heads "humorous" and "Adventure Narrative." Tell why you like or dislike each. Try to determine the basis on which each comic appeals to reader's interest.

q. Feature student verse that has real literary merit.

r. Clip several examples of poor advertising layout and explain why they are poor.

10. Magazines

   a. Select four magazines in different fields and give reasons for your choice.

   b. To establish good relations with European school children, your school intends to send magazine subscriptions to reveal life in the United States. What magazines would you suggest? Why?

## Teaching About Motion Pictures[26]

1. Analyze your motion picture habits. How often do you go? How much do you spend on movies in a year? How do you decide upon which picture to see?
2. Prepare a list of good motion pictures you have seen in the last three months. Next to the name of each, list its theme, the type of entertainment it was, whether or not it was an adaptation, and how you rated it.
3. Compare a book with its film version.
4. Briefly explain how a film you saw helped you to understand a problem of deep significance.
5. Describe how a film you have seen gave you valuable information about a vocation or profession in which you are interested.
6. Of the many foreign films which have been shown in this country, describe one which gave you a good idea of life in the country of its origin.
7. If you were asked for a list of suggestions on how to improve the quality of films in general, what would you recommend?

## Teaching About Radio and Television[27]

1. Prepare a list of your own questions to ask of a celebrity.
2. Compare style and opinions of two different news commentators.
3. Compare one of the afternoon drama serials with a play of established reputation.
4. Listen to a forum program and decide with whom you agree. State your reasons.
5. Discuss the reasons for growing tired of a certain program and your reasons for continuing to enjoy another.
6. In class, conduct a debate on the subject: "Shall Radio and T.V. Advertising be Abolished?"
7. As a class project, prepare a score sheet to be used in rating and evaluating programs.

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[26] _Ibid._, p. 20.

[27] _Ibid._, p. 20-22.

8. Plan (small groups of about 8-10) trips to radio and T.V. stations, where the students will meet radio and T.V. personalities.

9. Have a professional radio or T.V. personality visit.

10. Apply literary taste to programs viewed.

    a. Plausibility of the action

    b. Excellence or quality of direction.

11. Compare advertisements of several different brands of the same product . . . of cigarettes, for example, or tooth paste, or packaged cake mix. How much factual, verifiable information is contained in the advertisement? Enough to provide a basis for choosing among the brands? How would you verify it?

12. Have student and teacher prepare a questionnaire on listening and viewing habits. The number of hours spent each week on different kinds of programs should be included. One could also be prepared on listening time of other members of the family or other adults.

13. Discuss how large a role broadcasts should have in one's life. What does one sacrifice by staying glued to a set? Why is time often called man's most priceless possession? What would be a sensible amount of time per week for broadcasts? How can we decide whether we are getting our time's worth? What other activities are worth while?

14. Summarize in few words as possible radio and T.V. dramas.

    a. "Good guys beat bad guys."

    b. Teenager gets into trouble and out.

    c. Estimate probability and truth to life.

15. In radio

    a. Test ability to listen for information; have teacher read a three-minute article from Time, Newsweek, Atlantic Monthly, Reader's Digest, jot down the central thought and the main points as you listen. Then write a brief paragraph or precis. Read these aloud and check omitted or mis-stated information.

    b. Listen to a live five-minute newscast or news commentary, or use the school public-address system for student newscast. Take notes and write a brief summary of the newscast. Have class discuss and determine what items were omitted or maybe mis-stated.

    c. Watch films and make a list of items learned from them that will help you to improve listening habits: From "Society for Visual Education"

   - (1) HOW TO LISTEN
   - (2) HOW TO TELL THE DIFFERENCE BETWEEN ESSENTIALS AND DETAILS
   - (3) HOW TO DISCOVER THE PURPOSE OF A SPEAKER

d. Have students assume the part of newswriters for a radio station; use a recent newspaper and clip a dozen or more items that they would like to use in a broadcast. Sort these into piles: foreign, domestic, local, human interest. Tape these reports and evaluate them orally.

e. Write one of the weekly reports including the following items (4 minutes).

   - (1) Lecture by a well-known radio newsman.
   - (2) Fashion show put on by the senior class girls.
   - (3) A Spanish, (French, German) play before language classes.
   - (4) A football game (any other sport) last week.
   - (5) A senior class party or dance.

f. Listen to at least four announcers from sections geographically widely separated. Do you detect any differences in pronunciations? List them.

g. Listen to a radio talk and then answer the following questions in your notebook:

   - (1) What was the name of the speaker?
   - (2) What was his subject?
   - (3) What audience was he addressing?
   - (4) What was his purpose?
   - (5) What was his time limit?

h. Choose a leader and six speakers to engage in general discussion on one of the following topics:

   - (1) Should there be student government in this school?
   - (2) Is a high school education necessary for success in life?
   - (3) Should there be a public swimming pool in our city?

i. Discuss a radio play to which you have recently listened. Did the music add to the vivid telling of the story? How? Was the music used for transitions? or background? Was the music itself ever in the spotlight? Explain. Discuss what the play would have been like without the musical effects.

## Evaluation of Critical Thinking[28]

1. By teacher through the use of:
   a. Objective tests for checking mastery of certain basic vocabulary concepts.
   b. Essay tests calling for practical application of reasoning processes.
   c. Essay-type writings which will disclose attitudes of questioning, skepticism and tolerance.
   d. Observable evidence of improved attitudes.
2. By pupil through questions such as:
   a. Has the training in critical thinking given me more confidence in my own judgment?
   b. Do I question the reliability of information dispensed in mass media?
   c. Do I avoid hasty judgments?
   d. Do I listen with tolerance and objectivity to the opinions of others?
3. By parents through questions such as:
   a. Has your child become more questioning and analytical of materials he reads?
   b. Has he shown the ability to reach a decision? Does he make better decisions than formerly?

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[28] *Ibid.*, p. 23.

## DEVELOPMENTAL VOCABULARY ON CRITICAL THINKING[29]

ad hoc
analogy
assumption
authority
biased authority
conclusion
constructive
criticism
critique
deduction
destructive
dichotomy
empirical
evidence
fact
fallacy
generalization
indoctrinate
induction
inference
informed
interpretation
interpretation
irrelevant
judgment
logic
major premise
minor premise
major term
middle term
minor term
observation
opinion
phenomenon
post hoc
pragmatic
prejudice
propaganda
qualified authority
relevant
reliable
research
statistics
stereotypes
subversive
syllogism
unbiased authority
unqualified authority
valid
verification

## PROPAGANDA DEVICES[30]

1. "Name Calling"
2. "Glittering Generalities"
3. "Transfer"
4. "Testimonial"
5. "Plain Folks"
6. "Card Stacking"
7. "Band Wagon"

## SYLLOGISTIC DESIGN[31]

Syllogism has three steps and three terms:

Major Premise
Minor Premise
Conclusion

Major Term
Minor Term
Middle Term

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[29] *Ibid.*, p. 24.

[30] *Ibid.*, p. 25.

[31] *Ibid.*

| | | |
|---|---|---|
| Major Premise | Middle Term | Major Term |
| Minor Premise | Minor Term | Middle Term |
| Conclusion | Minor Term | Major Term |

Examples:

Logical Syllogism

All men are fallible.
John Hale is a man.
John Hale is fallible.

Major term - fallible
Minor term - John Hale
Middle term - all men

Fallacious Syllogism

All locks have keys.
I have a key.
I am a lock.

Major term - key
Minor term - I
Middle term - All locks

In the fallacious syllogism, the design of the terms has been violated.

## STEPS IN CRITICAL THINKING[32]

1. Define the problem

   a. A well-defined problem is clear, definite, limited in scope, and specific in objective.

      (1) Example - "How are jet planes refueled in the air?" Not "How are jets refueled?"

2. Locate information

   a. The pupil must ask himself:

      "Does this apply to my problem?"

3. Organize the information.

   1. Main ideas with their supporting facts

4. Evaluate

   a. The student examines the information with an inquiring attitude.

      (1) "Who said this?"

      (2) "Does the writer know what he is talking about?"

      (3) "Is this statement of fact or of opinion?"

      (4) "Is the information up to date?"

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[32] *Ibid.*, p. 25-26.

5. Draw conclusions.
   a. Before drawing conclusions pupils should be able to relate facts to each other, to see cause and effect relationships, and to weigh evidence.

## OBSTACLES TO CRITICAL THINKING[33]

1. Poor Language Facility
2. Curbed or Neglected Curiosity
3. Authoritarian Environment
4. Lack of Information or Facts
5. Lack of Direct Teaching

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[33] *Ibid.*, p. 26.

## CHAPTER 3

# SOCIAL STUDIES

WORLD GEOGRAPHY

# APPRECIATION OF OTHER PEOPLES WITHOUT PREJUDICE

Social Studies Grade 7

A major problem in social studies which becomes a concomitant objective of the whole course is that of whether there are superior and inferior races and nationalities, or whether mankind is one and races and nationalities are interdependent, so that we need to break down man-made barriers.

We try to develop an understanding of the way of life of peoples in various regions or countries and of their problems in adjusting to their environment by:

1. Understanding the reasons for their regional or national pride.
2. Respecting their ways of living as reasonable under the circumstances, and not strange or odd.
3. Understanding the way each region or country fits into the world picture.
4. Understanding that each race or country has its own heroes, many of whom have won world acclaim.

This can be done by assigned questions or topics, by class discussion questions, and by essay type exam questions which stress relationships, e.g., questions that begin with "Why --," "How --," "Discuss -- ," or "Tell likenesses or differences --" etc.

Stories and films of children or families of various ethnic groups or foreign nations in their home setting and at their customary work or leisure time activities are invaluable, as they give pupils background for making judgments. Recommended stories are:

1. Dr. George W. Carver (Graham and Lipscomb)
2. North Fork (Doris Gates)
3. Mary Jane (Dorothy Sterling)
4. Daughter of the Mountains (Louise Rankin)
5. Rachel (Mina Lewiton)

Excellent films dealing with prejudice are Brotherhood of Man, The High Wall and The Toymaker. Other fine films are The Major Religions and various films on the work of the United Nations, UNICEF, etc., showing that human needs are universal, and the response to needs must be universal, too.

The films seen by the whole group are always preceded by suggestions of things to look for, and are followed by discussion. If they deal with prejudice, topics discussed are:

1. How people become prejudiced.
2. How people can avoid prejudice.
3. Why prejudice is wrong.
4. Proofs that none of the major races is physically or mentally superior or inferior.

When films on the geography of other regions or countries are shown, pupils are asked, among other things, to look for:

1. Likenesses or differences between this region or country and ours.
2. Reasons for the likenesses or differences.

## BEHAVIOR RULES SET BY STUDENTS

Social Studies Grade 7

One thing I do at the beginning of each year is to ask the students to help me to make a set of rules which they are willing to live by for the year. I ask them to think about it and write some of their ideas on paper. Then they meet together in groups, each group taking one area. The areas are: classroom, auditorium, hallways, cafeteria and playground. The chairman of each group reports to the class the list which his group has worked on in its area. This has worked well with me for several years.

## RULES MOLD CHARACTER

Social Studies Grade 7

HOW CAN OUR RULES IN SCHOOL AND AT HOME MOLD OUR CHARACTER OR HELP US TO KEEP THE LAWS MADE WHEN WE ARE ADULT PEOPLE?

How are rules and laws alike? Are there any differences between rules and laws? Such questions are posed about rules:

Why are they necessary?
Are they worthwhile?
Do they get the right results?

Then we talk over and find out how laws are made.

Why are they necessary?

Are they good?
Do they enforce the laws?
How are laws enforced?
Who obeys the laws (statistics)?

We find and collect information on different laws:

How are they made?
Why are they made?
How are they enforced?
Who are the law breakers?
Who obeys the laws?(positive thinking)

After this study, we try to show the relationship of our rules in school and at home and our laws. We also project how our present rules mold our character for the future and help us to become adults and law abiding citizens.

## ERRONEOUS IMPRESSIONS OF OTHER COUNTRIES CORRECTED

Social Studies Grade 7

Before beginning a unit on the Soviet Union (Japan, India, Iraq or any other frequently misunderstood country,) the students were asked to think about all they knew of this nation, its people, its political organization, its geography, its history and its present position in world affairs. After organizing their thoughts, impressions, and knowledge of the subject, they wrote positive statements concerning their beliefs. These were then compiled by the teacher into a list of forty or fifty statements, mimeographed and returned to the students. Class discussion, with a minimum of teacher comments, soon led to the dismissal of several statements as obviously false. There was a great deal of controversy concerning many of the remaining statements, but the teacher did nothing to clarify the situation. The students were to determine the truth or falsity of the items through their study of the countries. As they progressed in their studies, they found many of their former ideas to be partially or wholly erroneous. Many of the students were genuinely puzzled by their discoveries concerning these nations, and they could not understand how they had gotten their original ideas. This confusion as to the source of their thoughts led to further discussion on the subject of how ideas and concepts are formed.

This in turn introduced the concept of propaganda and the ever present need for clear, purposeful thinking which is so necessary in the world of an expanding mass media of communication.

## ALL MEN ARE CREATED EQUAL, BUT . . .

Social Studies Grade 7

The approach we are using in geography class is that all men are created equal. If all men are created equal, then why are men so different? This is a very stimulating approach for the student.

As we read the units we look for the facts (education, government, natural resources, ancestral background, and geographical location of the region.)

After we know the facts, we then in a group discussion, decide why the people of this region differ from the people of other regions.

Facts are not just to be learned, but are to be put to us through showing their relationships. It is therefore, through the use of facts that the student is stimulated to do his own critical thinking.

## CHALLENGE OF OPTIONAL ESSAY QUESTION

Social Studies Grade 7

ORAL APPROACH: I employ a questioning approach when a child gives a half answer in class discussion. I have him support his statements, and if he does this satisfactorily, I then ask a similar question to see if he has mastered the line of reasoning well enough to approach another problem and is equipped to think it through.

EXPLANATION: This problem of testing the child's ability for critical thinking happens to be one about which I have recently been seriously concerned in regard to my classes. I approached it on the first exam by asking an essay question which was optional: "Explain how, from the time the Europeans wanted to find a trade route to the East Indies, an age of exploration developed and then an era (or time) of colonization."

I allowed this question to be optional because I wanted to see who was willing to accept a challenge and to attempt to tie the facts of each period together. The students showed me who were confident of their knowledge of the subject matter, and who were capable of critical thinking.

## NEW USES FOR FAMILIAR MATERIAL

Social Studies Grade 7

In social studies, I like to give assignments such as this: Think of as many uses for aluminum as you can. Then see if you can think of any new uses for it. I find that such an assignment allows the child to be creative and at the same time requires him to arrive at a basic understanding about the product in question.

I suggest an excellent source book on this topic: Jerome Bruner, The Process of Education.

## DISCUSSION OF CONTROVERSIAL ISSUES

Social Studies Grades 7 - 8

In discussing controversial issues, both sides of the problems must be presented and opinions labeled as such. The local prejudices should be known, but should not be allowed to continue unchallenged. If the time arises, teachers should have devices developed for diverting discussion, and if the public sentiment becomes insistent, the topic can be changed, but later reinstated. Insults and arguments which may invite retaliation should be avoided, and it should be kept in mind that teachers are after developing careful thinkers, not followers.

A citizen who is able to contribute to the formation of sound public opinion is one who arrived at his decisions on public issues by a process of critical thinking and acts constructively, either as an individual or as part of a group.

## COMPOSING AND ACTING OUT A SKIT

Social Studies Grades 7 - 8

Occasionally in eighth grade history, but more often in seventh grade geography, I have the students work in groups or as individuals and compose a skit about the country or topic discussed.

The writer and performer in the skit must be clever enough to act out his part and to give some practical information to the class. The "audience" must be clever enough to be able to detect the part the "actor" is trying to play.

In the study of Mexico, the performer might be dressed like a Mexican farmer. He might say that he lives in a region where there is ideal rainfall for certain crops, and he might name those crops. He might also go on to mention how his family lives, etc. He has to be well enough informed to know what occupations occur in the different regions of Mexico and clever enough to organize his material so that the other students will not guess "who he is" immediately.

The audience must be able to put the facts together by saying: "Since he does not irrigate his crops, he probably does not live in Northern Mexico."

They then take note of the crops mentioned, the amount of rainfall mentioned, etc., and finally conclude that this person is a farmer of the fertile Central Plateau area near Mexico City.

## CAN WE ACCEPT EDITORIAL OPINIONS?

Social Studies Grades 7 - 8

Each student brought to class an editorial he had read in either the local or area newspaper. We discussed briefly the remarks made by the various editors and as a group formulated the following problem:

Can we accept at face value the opinions of editors, or writers, as stated in their editorials or articles?

After defining our basic problem, the students decided they would need additional information before they could make an intelligent evaluation of the editors' comments.

As a group, the students decided to gather all the data they could find related to their editorial for a week. This would include: Newspapers, magazines, radio, and television. At the end of a week's time they brought their collected data to class, in addition to their original editorial.

At this time, I had each one of them write a personal evaluation of his original editorial based on his research findings.

A general discussion followed, in which it was pointed out by class members that before we can blindly accept others' opinions we usually need additional information.

Only after personal research can we intelligently accept or reject the opinions of others.

## ACTION OF OHIO LEGISLATURE FOLLOWED CLOSELY

Social Studies Grade 8

In our study of Ohio history, we attempt to gather every bit of information that we can which relates to Ohio. The students watch the newspapers, radio, and television for items of interest. When the legislature is in session, clippings are collected daily and the activities of the legislature are followed very closely.

In all of this activity the students are encouraged to examine the data very carefully and compare it with what they have read or what has been introduced by the teacher.

The students are taught to look at all the facts critically and draw conclusions on the basis of the evidence. The teacher presents his material in such a way as to indicate that critical thinking has gone into this preparation.

Students are given examples of how a lack of critical thinking has led to unfortunate conclusions.

## JUDGING ACCURACY OF NEWSPAPERS AND TEXTBOOKS

Social Studies Grade 8

I. Students purchased a daily paper and followed a series of articles concerning items in the news. Their attention was called to statements of fact and statements of opinion by people interviewed or people concerned with the event. Students thus become conscious of words such as "said, believe, appears, felt" as being clues that opinions and not facts are being given.

News items were then analyzed by students. They listed facts in one column, opinions in another and judged the accuracy of the paper's reporting.

II. A textbook used in the public schools of Alabama was used as a class reference in the study of the War Between the States. A textbook used in Canada was used as a reference during study of the Revolutionary War and War of 1812. In comparing discussions of historical events in these books, students became aware that many textbooks contain statements of an author's opinion based on the facts as he sees them. Students found that different author's with different backgrounds, may reach different conclusions.

## HOW TALL WAS LINCOLN?

Social Studies Grade 8

The principal aim of history is to develop an individual as an objective critical thinker. Research is the way that we approach the subject. The first step is to have as many sources of information as we can; the next step is to evaluate the information. Who was the author? Is he an authority in the field? What makes him an authority? Why has the particular work been written: to defend a belief, to persuade others in believing, or was it an objective (as near to objectivity as one can be) historical work? With this type of research the student sees the implication that maybe a "historical fact" is not a fact at all. He also comes into contact with primary and secondary source material. He begins to have an insight concerning the validity of research material.

An example of basic research which is used as the first topic for study with an eighth grade class is: How tall was Abraham Lincoln? The traditional answer in text books is six foot four inches. From research the students find the answer from six foot one inch to six foot five inches. Most of the classes, after evaluating the information, believe Lincoln was only six foot one inch. Why do text books say that he was six foot four inches? Answers that I have received are: (1) maybe because Lincoln was lanky and wore a high hat he appeared to be taller than he was, (2) maybe he wore boots with high heels,

(3) since men were shorter one-hundred years ago, maybe it is our interpretation that Lincoln was taller than he actually was, (4) maybe we are attempting to make Lincoln into an American myth. The students realize that the height of Lincoln as such is not important, but if there are inconsistencies concerning the physical point of view there might also be inconsistencies concerning the intellectual and abstract view of an event.

In summary, the student, to be a critical thinker, must find as much information as he can pertaining to the topic; he must limit his information to the exact problem at hand; he must evaluate his information and sources of information; he must look for any inconsistencies in his development; and finally, although he can give his solution to the problem, he must keep in mind that his answer may not be the final answer.

## APPOINTING A CHAIRMAN AND COMMITTEE TO PURSUE FACTS

Social Studies

Grade 8

Often during the course of a class discussion a question arises that is of great interest to the class and yet cannot be immediately answered. Research concerning such questions can be of great value to the students in developing good study and critical thinking skills.

A student chairman is selected who in turn chooses a committee to work on the problem. The committee gathers information from current periodicals, historical literature, and reference books. Realizing that many problems cannot be immediately solved, the group finds the causes of the problem and proposes several alternatives for solving the problem.

This information can be presented to the class through a student panel discussion. Questions from the class can be directed to the panel for discussion. The moderator with aid of the teacher can sum up the results of the study and develop sound conclusions based on the revealed facts.

In conclusion, critical thinking skills can be best developed whenever a problem is of particular interest to the class. This motivation is necessary or such a project may become a task instead of an adventure in learning.

## PROVIDING EXPERIENCES DIRECTLY INVOLVING THE STUDENT

Social Studies

Grade 8

The study of the events of history and the organization of government must be intregrated, with the causes and effects of social change, into meaingful experiences directly involving the student. In order to implement this idea into actual practice I insist that my students do outside readings in both American history and government classes. In history we examine various viewpoints ranging from the American Revolution, Jeffersonian idealism vs. Jacksonian democracy, the Civil War, to modern day issues such as the role of the federal and state governments. On many occasions past events can be made more meaningful in the light of today's history and thought.

I am presenting a concrete illustration in a unit I have taught on the functions of the legislative branch of our federal government. At the same time we study the operations of this body, we study current legislation before it. We decided on the current tax cut legislation, and I listed current sources for resource material. At the end of the week, I asked for a critical examination in a written report, including documentation. In this report the student was to summarize the pros and cons and at the end to state his opinion backed up with reasons for it.

The class period consisted of a sharing of views on this issue. The goal was twofold. The first was for the student to gain an understanding and appreciation for the views of others. The second was for the student to come to a realization of a personal interest in an issue the youngster will soon be directly involved in as a taxpayer. The results of this exercise appeared to justify the time and effort spent. I believe that the comprehension of facts, when related to direct student involvement in meaningful experiences, creates a successful learning situation.

## STUDY OF AMERICA'S WEAKNESSES AND GREATNESS PRECEDES FIELD TRIP

American History Grade 8

My class works on the project of discovering how and why Modern America was built on the foundations established by Colonial America with her old-world background. While many European nations planted colonies within our country's confines, it reamined for the original thirteen colonies to be successful in their struggle against foreign domination. We discover how, slowly but surely, America evolved into the present great land of freedom and opportunity. We discuss her weaknesses as well as her greatness.

Our basic text is supplemented heavily with resource material. We gain a keen insight into our American history and American heritage by using films, library sources, pictures, magazines, encyclopedias, special news reports, literature, art, folk music and an antique show plus field trips. The grand finale to this unit of study is a two-day field trip to Greenfield Village in Dearborn, Michigan. Our students spend two days steeping and browsing in the archives and symbols of our great America. It is hoped that at the conclusion of this years' Social Science Unit each eighth grader at Dennis Smith School understandswhat William Tyler Page was saying when we wrote the American Creed which is given below:

> I believe in the United States of America as a government of the people, by the people, for the people; whose just powers are derived from the consent of the governed: a democracy in a republic; a sovereign Nation of many sovereign States; a perfect Union, one and inseparable; established upon those principles of freedom, equality, justice, and humanity for which American patriots sacrificed their lives and fortunes.
>
> I therefore believe it is my duty to my country to love it; to support its Constitution; to obey its laws; to respect its flag; and to defend it against all enemies.

## ORGANIZED PLAN FOR TEACHING CRITICAL THINKING

World Geography Grade 10

Tentative Plans - Early in the school year the social studies teacher makes tentative plans for both semesters. She interweaves content material with the teaching of the critical thinking skills. In order to stimulate transfer of learning in the area of critical thinking skills, she schedules classroom activities which are similar to life situations. By making preliminary plans, which are flexible and which allow for questions and problems initiated by the pupil, the teacher avoids the disadvantages which are inherent in the incidental teaching of critical thinking skills.

Motivation - Inasmuch as the pupil must feel the need of acquiring a skill, the teacher provides classroom situations which encourage the pupil to develop skill in critical thinking. She correlates the study of history and geography with the reading and discussion of pertinent current affairs.

Explanation of the Specific Skills of Critical Thinking - Re-phrasing the customary wording of the specific skills of critical thinking and using terminology familar to the pupil, the social studies teacher suggests to the pupil the following step-by-step procedure:

1. Ask yourself: What is the exact question or problem being discussed?

2. Get as much information as possible.

3. Organize information; list main topics and subtopics.

4. Try to think of several possible answers to the problem.

5. Evaluate; criticize the several possible answers.

6. Come to a conclusion based on available information.

In addition, the teacher points out that the procedure used in constructing a map or time-line coincides with the steps of thinking used in discussing a controversial question. In each situation the pupil defines the problem; collects and organizes information; evaluates various solutions; and comes to a conclusion based on available information. Thus the teacher attempts to tie her explanation of the steps of critical thinking to the pupil's experiences.

Meaningful Concepts - Certain words, such as fact, opinion, one-sided-story, used in evaluating information, are abstract. These concepts must be made meaningful. To achieve this objective the teacher displays in the classroom spectacular advertisements and asks the pupil to find in them graphic examples of an opinion, a fact, and a one-sided-story.

Distributed Practice of the Skills of Critical Thinking - The teacher must plan for the repeated use of the skills of critical thinking in varied activities. She must provide opportunities for the pupil:

1. To be open-minded and to study both sides of a controversial question.

2. To collect and organize information from textbooks, maps, periodicals, reference books, films, and the community.

3. To evaluate the authenticity of information gained from textbooks, periodicals, films, and newscasts.

4. To evaluate various solutions to a problem.

5. To come to a conclusion, based on available information.

In other words, the social studies teacher must encourage the pupil to do research and to participate in forums and panel discussions.

Transfer of Learning - When the study of history or geography is correlated with current affairs, much emphasis is on controversial problems which directly affect the life of the pupil. Under these circumstances the pupil comes to realize that he can make use of critical thinking in his own life.

Summary - The fact that critical thinking is a composite of skills makes the teaching of critical thinking difficult. Therefore a planned program, which allows for questions and problems initiated by the pupil, is more advantageous than the incidental teaching of critical thinking skills.

## PLAY-ACTING A GOVERNMENT COMMITTEE

World Georgraphy Grade 10

Play-acting a government committee may be fun, but it is also hard work and very informative. Our world geography course emphasizes geography and world affairs. Areas of the world are studied in relation to their specific problems.

Classes are divided into groups. Group activities are patterned after those of government committees assigned to recommend solutions for the problems of a specific area. The film, "Planning Our Foreign Policy," (borrowed from the public library) is viewed. The Committee on the Middle East, in session in the film, is used as our model. As expressed, the problem is: How can the U.S. preserve the security and stabilize the economy of the Middle East? History and background are presented to give perspective. The military advisor gives information about current and proposed measures. These measures are briefly evaluated and related to the politics involved by the chairman. The socio-political expert takes over. He explores the situation at present and makes proposals. Next the economist gives his views. After leading a lively discussion, the chairman takes a concensus of opinion, and gives a summary with recommendation of further appraisal of the solution after a limited period of time.

Therefore, the student groups employ the following problem-solving techniques:

1. The problem of their area is identified.
2. As individuals, they collect pertinent data and information.
3. In the group, the data and information are organized.
4. With the class as an audience the above processes are reiterated and various solutions are evaluated in view of the assembled data bearing on the problem. The "best" solution for the problem is selected.
5. After studying current events for a limited period of time there may be a revision of the solution.

## PROMOTING WAYS OF THINKING BASED ON INQUIRY

Social Studies Grade 10

In a Tenth Grade Core unit on Cross-Cultural Understanding, the underlying purpose was to promote ways of thinking based on inquiry and examination of ideas, attitudes, and values rather than on unexamined acceptance or rejection of them. One of the main curricular experiences was to involve the students in the method of critical inquiry as the essential tool of the social scientist. To demonstrate by actual example how a social scientist operates, we used a social psychologist who had just completed his doctoral dissertation. We had been stressing the need for each student to feel himself into the role of a social scientist, to begin to think and behave as such as he undertook a depth study. For instance, a statement of an hypothesis was required. As the social psychologist took his audience step by step through his own research problem, the students became more fully aware of the meticulous care that is required in collecting and interpreting social data. He gave a structure and a rationale for social scientific inquiry that was reflected in a number of subsequent student reports.

Two weeks were devoted to background reading in the various research areas; individual and small group conferences were held with the teacher to give guidance to and approval of research projects; appointments were made with previously used resource people; questionnaires were devised, sample tested, revised, and administered; house-to-house interviews were conducted; and in general, the time was spent in a social studies laboratory atmosphere.

The end product of this activity can best be expressed by several brief descriptions of a representative sampling of research reports.

One of the most scientifically-oriented undertakings was to test the hypothesis: A person with a high knowledge of anthropological and sociological facts tends to be less racially prejudiced than a person with a low knowledge of such facts. The student used three situations requiring a forced choice to determine prejudice and adapted a "Cultural Facts and Fancies" checklist to find out the extent of factual knowledge of his respondents. He was careful in his conclusion to state the limitations of his research and to make only tentative statements concerning his findings.

A further approach to understand more fully cultural and prejudicial attitudes was undertaken by both a Negro and a white student. They were intent on testing two hypotheses: (1) The residents of higher income segregated areas are more reluctant to have Negroes move into their area than the residents of lower income segregated areas, and (2) the residents of both income areas are more apt to change their answers to the question: What would you do if a Negro family were to move into this area? when a Negro conducts the survey than when a white person does. Four residential areas were chosen and separate house-to-house surveys were made. Their findings were inconclusive regarding their first hypothesis, but fully supporting of the second one. The range of attitudes and responses which the students encountered was particularly revealing and instructive to them as data-collecting "social scientists."

## TEACHING STUDENTS TO THINK OBJECTIVELY

World History Grade 12

As the study of history progresses, commonly held cliches and new propaganda slogans can be laid against the backdrop of history, e.g., "Better Red than Dead." In a recent class discussion, a boy, who is inclined to resent discipline and to theorize more than study and analyze on the basis of factual information, advanced the idea that were communism to take over in America, people would in time "get used to the idea" and wouldn't mind it. Another girl supported this view -- a girl who a few days later was one of two candidates nominated in a primary election for president of her class! Discussion brought out the importance of looking at history to see if mankind "got used to" the regimentation communism would entail. Students were encouraged to keep their eyes and ears open as we went through the course to find evidence.

In a similar way demagoguery, "pork barrel" - ism, licentiousness and libertinism; atheism; extreme nationalism; Marxism's claims and achievements; Communistic thrusts and epithets; non-contributive ideas about dating, marriage and divorce; dogmatism; as well as integration; federal aid to education; Alliance for Progress, Peace Corps, internationalism; medical care for the aged, etc., etc., can be scrutinized.

Debate, panel discussion, class discussions as problems arise in the minds of the students, who have been stimulated to think objectively about matters that affect their daily lives and growing experiences, often create opportunities for guidance in thinking one's way through a problem penetrating beneath the surface, penetrating encrustments that traditional and "pat" ways of thinking have produced, drawing upon all the resources of history that can be brought to bear, and thus stirring the imagination to that a certain amount of restlessness is engendered which will carry on outside the classroom. Balance and fairness are keys to stimulating rather than exploiting or stifling the critical attitude.

Current events, international, national, and local, afford an opportunity to examine points of view and sources of information. Current events are best discussed rather than "reported on." The Socratic method of analyzing public issues can accomplish genuine critical and (its counterpart) constructive thinking. Providing the opportunity to subscribe for a variety of magazines at student rates, both for those prepared for school consumption and those prepared for the news stand, affords the opportunity to teach for transfer of critical thinking into out-of-school life.

The critical attitude can and should extend to critical attitude toward what the teacher says. Students are inclined to learn by rote and parrot back to the teacher what they think the teacher wants, too often. Deliberate misstatements to see that students are alert can sometimes be used. Once the students are oriented in checking statements, even those made by specialists and those who are supposed to be authoritative, a wholesome situation can develop. In the classroom honest mistakes are detected and corrected. This, far from detracting from, enhances the learning situation; for a teacher, who is himself learning inspires a great deal more enthusiasm for learning than one who (thinks he) overawes because he"knows it all."

## QUESTIONS FOR CRITICAL THINKING IN WORLD HISTORY

World History Grade 10

Here are a few questions to try with your students. These, you'll see are designed to encourage students to use what they've learned about ancient and medieval times in doing some independent thinking about the relationships in history -- looking for causes and effects, comparing and contrasting, different times, places, and developments.

Do you think there is a connection between the growth of political democracy in Athens and the development of original thought and creativity in the arts?

Probably more inventions appear in one year today than appeared in 1000 years during the Stone Age. Why?

In what respects was Athenian democracy similar to that in the United States today? In what respects was it different?

Some historians believe that Marathon and Arbela were among the most decisive battles in history. Explain why.

To what extent do you think Julius Caesar was responsible for the collapse of the Roman Republic?

Generally speaking, what do these periods of history have in common: Athens under Pericles; Rome under Augustus; India under the Guptas; China under the Tangs?

How did the rise of towns in medieval Europe stimulate education and the arts?

In what ways and for what reasons did the development of early Russia, from the ninth to the fourteenth centuries, differ from that of Western Europe?

## TEACHING INDUCTIVELY AND DEDUCTIVELY

World History Grade 10

Sometimes the same lesson can be presented deductively or inductively, or both procedures may be needed to help students learn to use careful judgment.

For instance in a study of the Middle East, one might first present general characteristics, physical, economic, political, and social, of the area, then set the students to discover which of the characteristics exist in specific Middle East countries assigned to them. After comparing their findings with the general features of the area, they should be prepared to make a generalization on the extent to which a given country is typical of the Middle East.

On the other hand, one might start with an examination of Middle East countries individually, then select features and factors common to several of them in order to construct a general picture of the area.

The same procedure could be applied in a study of Mediterranean climate. After learning what Mediterranean climate is and the combination of circumstances which creates it, a class might be expected to figure out the places where these circumstances would occur and thus discover where Mediterranean climate exists. Or, equipped with a list of places which have Mediterranean climate, students might try to determine what those regions have in common that would cause their climate to differ from that of areas around them.

Critical perceptions may be encouraged by assigning the same topic in several sources.

The students can see not only that the authors do not present the same amount of material in the same way but also that some writers are more thorough and some make a clearer presentation than others; that the scholars may have conflicting points of view and make different connections or draw dissimilar conclusions. A young person can and should learn that not all sources are of equal value to him.

## HELPING THE STUDENT HAVE GRIST FOR HIS MILL

World History Grade 10

In order to think critically a student must have "grist for his mill." Content to be evaluated critically consists of ideas the student has, or of which he has heard as he enters the classroom, and ideas to which he may be introduced or exposed within the classroom.

Ideas he already has are much more tenacious and tend to be more difficult to refine than ideas to which he may be introduced within the classroom. But he will get little practical experience in critical thinking unless at some point he makes a critical evaluation of some of his own ideas--the ideas he has before he comes into the classroom.

The ideas he has are ideas to which he not only has been introduced, but which he has embraced. In his consciousness, also, no doubt, are some ideas to which he has been introduced, but which he has not yet embraced, nor rejected. He may also have been introduced to some ideas which he has rejected, but which more information and light may cause him to reconsider.

Critical thinking can help the student correct, modify, refine the ideas he has embraced, render some sort of decision concerning ideas for which he has suspended judgment, and gain new insight into and appreciation for some worthy ideas he may have rejected. He can learn more about and gain new insight, appreciation, etc., for new ideas presented for his consideration.

In teaching world history, the entire approach is a critical study. In the beginning of the course the students are introduced to concepts such as the reliability of primary and secondary sources. They are put on the alert to evaluate materials that are presented to them, as a detective evaluates the evidence and testimony presented to him. They are advised that while a detective may solve his case and say, "Case Closed," a good history student can never say, "Case Closed."

The problem of the origin of the universe and of life provides an excellent opportunity to orient students at the outset in critical thinking. There are, for example, several ideas about how the earth, animals and man came into existence. There is the interpretation of modern science, which, while it satisfieds the American Association for the Advancement of Atheism, as well as agnostics, fails to completely satisfies the equally scholarly theologically minded who regard all of life as a great mystery and have little difficulty in continuing to look with not only respect but a great amount of reverence on the account found in Genesis. Acceptance of this account as having validity is not without its difficulties; but there are difficulties in the acceptance of other accounts.

## READING AND RESEARCH UNIT

United States History Grade 11

I use a "Reading and Research Unit" that achieves the three-fold purpose of exposing the student to a variety of resources in the field, of motivating the student by individualizing the topics researched, and of developing critical thinking by both the method of research required and the type of analysis demanded of the data collected. The ten exercises cover a wide range of historical research. Approximately six weeks are devoted to this unit with most of the class periods during that time being spent in the library. Student response at first is, "Is this what you want?"; however, after the tenth exercise I frequently hear the heartwarming battlecry, "Just because someone wrote it doesn't make it true!" Following are Exercises in the "Reading and Research Unit":

### Exercise I (American Heritage)

In recent years there has developed a trend that present historical information in a style that has popular appeal. These accounts are not to be confused with historical fiction, but they are often written in a journalistic, easily-read style. These books and articles are not concerned with cause and effect relationships and over-all generalizations, but focus attention on one dramatic event or personality in our history. The American Heritage is one of the outstanding works of this type.

It is the purpose of this exercise to investigate the validity of such an article and to decide its relative importance as an item of research.

1. Read the article and note specific comments or historical facts and references.
2. Record incidents and conjectures that may not seem to be historical fact.
3. Check the above items in a standard reference work and note substantiations and points in conflict.
4. Comment on the value of the article as an item of historical reference.

Student's Article:

### Exercise II (Biography)

Ralph Waldo Emerson was of the opinion that all history could be studied through biography. While the topical and periodic approach is essential, it is obvious that the lives of important people certainly will reflect the history of their times. It is necessary, however, to realize that the author's prejudices will color the events to suit their own convictions and what sometimes passes for fact is often only partial truth or out-and-out fabrication. As most biographies reflect the point of view of the author, it is also true that autobiographies are to be used only with an understandable caution.

The proper historical approach toward biography is to read two or more books about a personality, one favorable and the other critical. Annotated bibliographies and book reviews will help you to make the proper selection.

For the purpose of this exercise you are to compare a biography with the authoritative, supposedly unbiased, account in the Dictionary of American Biography. The comparison should be done in four areas:

1. The subject's early life and education.
2. Reasons for the selection of his profession.
3. One outstanding incident for which the subject is famous.
4. A general evaluation by the author.

Carefully check each account and then check any discrepancies in other standard reference works.

Student's Book:

## CRITICALLY EXAMINING SOURCES

Social Studies Grade 12

Even advanced pupils have preconceived notions on social problems. Sound conclusions on these social questions are derived from critically examining all resources which might touch on the problem. Starting from such notions in a class on socio-economic problems, pupils learned critical thinking skills through examination of problems in prejudice, juvenile delinquency, mental health, and the population explosion.

The class evaluated present practices in the light of history, current attitudes held in the United States and other parts of the world, and the present and future effects of such practices on this country. Basic texts and movies contributed historical information; citizens from the community brought current attitudes to the class in discussion periods; and examination of periodicals projected effects on the American future. Pupil reports on related books supplemented the other approaches. Students then related problems and understood that one often grows from another.

Having gained some understanding of the causes and effects of specific social problems, pupils suggested solutions to the problems. Such solutions ranged from what an individual could do in his school and community to broader aspects of what might be done on a national and ultimately on a world level by agencies and individuals. At this point pupils faced the conflict between ideal and practical answers. Attempting to resolve this conflict, they tested their proposals before the class in a free discussion. At the end of the course, pupils wrote essays pertaining to specific social problems; they supported their conclusions with information gained from all sources they had examined.

## TEACHING A GOVERNMENT UNIT

Government Grade 12

Environment and Activities:

1. Reference materials--for analyses and reports
   a. Newspapers
   b. Magazines
   c. Books
   d. Maps, charts, etc.
2. Committee study
   a. For reports to class
   b. For panel discussions
   c. For display on the bulletin board
3. Special topics--the pro and con of important topics, as:
   a. The sale of wheat to Russia
   b. The Test Ban Treaty
   c. Regulatory agencies of the government

Some Ground Work:

1. Magazines are listed and topics are assigned.
2. Students for special studies are chosen, or they may volunteer their participation. It is necessary for the students to:
   a. Mention sources and give supporting evidence
   b. Give main ideas previous to their report
   c. Work as a member of a panel
3. A general questioning period is held, where both the student and the instructor may contribute ideas.

Methods of Approach and Follow-up Procedures:

1. Question period to precede study of a unit

2. Use of supplementary materials which apply directly to the main theme

3. Oral reports--on such topics as the Federal Trade Commission, the Securities Exchange Commission, etc.

4. Term papers, or an extended report on a major topic, or an important phase of the main theme.

General theme: Helping the Consumer Make Decisions

Some questions that might precede study of the unit:

1. What is the meaning of consumption?
2. Who are consumers?
3. What do we consume?
4. When is consumption direct? Indirect?
5. Is all consumption good?
    a. When may consumption be wasteful?
    b. When may consumption be harmful?
6. Do we consume goods to impress others?
7. When is money spent wisely? Foolishly?
8. Why do business people advertize?
9. What must the consumer watch for in advertizing?
10. Why does the average consumer find it difficult to get his money's worth?
11. Can the consumer get help in making decisions?
12. Is there any help that is free of charge?
13. Why is it necessary for the government to control interstate commerce?
14. What part does the government play in setting up standards? Labeling?

From this preparation we obtain the following results. Topics marked with an "X" were treated as special reports.

Non-governmental agencies that protect and guide the consumer:

X 1. Better Business Bureau

2. Private Consumer Research Agencies:
    a. Consumers' Union
    b. Consumers' Research

3. Trade associations:
    a. National Canners Ass'n.
    b. American Gas Ass'n.
    c. Underwriters' Laboratories, Inc.
    d. National Dry Goods Ass'n.

4. Newspapers and magazines
    a. *Good Housekeeping*
    b. *Parent's Magazine*

5. Professional Organizations
    a. American Medical Ass'n.
    b. American Dental Ass'n.
    c. American Home Economics Ass'n.

6. Money management booklets
    a. From banks
    b. From insurance companies

7. Consumers' cooperatives

Government agencies that aid and protect the consumer:

X 1. The U.S. Bureau of Standards

2. The U.S. Public Health Service

X 3. Federal Trade Commission

X 4. Securities and Exchange Commission

5. Department of Agriculture

6. Federal Food and Drug Administration

7. Bureau of Weights and Measures

8. Post Office Department

9. Weather Bureau

10. Bureau of Economic Research

11. Bureau of Labor Statistics

12. Interstate Commerce Commission

Evaluation:

1. Orally

    a. General summarization
    b. Stated conclusions

2. Written

    a. Essay questions
    b. Students must answer questions and then give application.

3. Results -- showed a depth of understanding of the problems facing consumers--what to buy, when to buy, and what agencies that will be of help.

## STUDENTS ASSIGNED TO DEFEND THEIR POINT OF VIEW

Social Studies

Grade 12

In Senior Social Studies, a vital part of our program is surveying problem areas in our country and in the world.

In analyzing different points of view regarding the program, I often assign students the responsibility of defending a certain point of view.

They present their ideas on the problem (e.g. Should the U.S. sell wheat to the Soviet Union?) and then we analyze various alternatives.

The students are expected to show strengths and weaknesses of various viewpoints and arrive at their finalized idea on the problem by the analysis of the strengths and weaknesses of the various plans. I feel that this is a very effective device in promoting critical thinking among the students. It is hoped that they will use the same method regarding other problems which come up -

1. Look at the problem.
2. Pick various alternatives regarding the solution of the problem.
3. Analyze the strengths and weaknesses of alternatives.
4. Arrive at a solution to the problem through the analysis of the strengths of various plans.

## UNDERSTANDING NEWS BIAS

Civics

Grade 12

Some of the activites we engage in to promote an understanding of news bias and critical interpretation of the news are listed below.

1. Required daily reading of the local newspaper with emphasis on editorials, letters to the editor, certain syndicated articles, current governmental and political news. These are frequently discussed in class and the facts for both sides are presented. Note is then taken of the absence of discovered opposing arguments in the newspapers, if this is the case.
2. Use of a series of tape recordings with workbook exercises on devices used by journalists to bias accounts of events, speechs, etc. These tapes are used in our reading laboratory and are very well done.
3. Investigation of sources of information that can be compared with those more readily available.

4. Visits to city council and a comparison of the meeting with the newspaper report of the meeting.

5. Final emphasis is placed on the critical need for the student to acquire the necessary understanding of "government in action" so that he will recognize bias when he sees it and will be able to implement the rules of critical analysis in his future decision making.

## HELPING STUDENTS TO DISTINGUISH BETWEEN FACT AND OPINION

Social Studies Grade 12

To learn to distinguish clearly between fact and opinion is an important step in critical thinking.

Ask the class if one person's opinion is as good as that of any other person. Invariably some students (sometimes many) will hold that one person's opinion is as good as any other person's opinion. Students confuse the equal right of people to hold opinions and to express them, with the quality of the opinions held.

A series of questions should be asked until students understand that the quality of one's opinion may be dependent upon such factors as one's ability and his training and experience in the field in which the opinion is being expressed.

When students understand that the opinions of all people should not be accepted as having equal value, use the following exercise to teach the difference between statements of fact and expressions of opinion: Using an editorial from a local newspaper, ask the students to determine whether certain statements are made as fact or as opinion. Ask the students not to try (in this particular exercise) to determine if the statements are true or false, but rather whether they should be classified as facts or opinions.

Follow this exercise by asking the students to examine those statements that are classified as fact and through research to find if they are indeed facts.

## STUDENTS LEARN TO CHALLENGE STATEMENTS

American Government Grade 12

The technique that I am suggesting is very simple. The teacher makes a categorical statement which the class is challenged to refute, sustain, or modify on the basis of facts or objective argument. I just finished the use of this technique in teaching about the electoral college as a method of electing the President of the United States.

Statement: "The electoral college as it functions today is undemocratic, antiquated, enhances the influence of the small rural states, and poses a serious threat to the government of the United States. Therefore, it should be abolished and a new method adopted for the electing of the President in keeping with the realities of the United States being an enlightened, industrial, and urban nation."

To refute, sustain, or modify this statement requires -

a. A knowledge of how the electroal college really functions.

b. Why it was originally adopted.

c. How it evolved in its present form.

d. Plus the answering of the charges made that it is undemocratic, antiquated, enhances the influence of the small rural states, and poses a threat to the government of the United States.

After analyzing the pro and con arguments of the electoral college method of electing the President, the challenge was given to the students to propose a better plan foP electing the President.

With teacher guidance, we examined the three proposed amendments now before Congress to change the method of electing the President and weighed the claimed advantages and disadvantages of each proposed amendment. The students were then given the opportunity to state their preference for the method they thought best.

# TEACHING ECONOMIC LITERACY TO ALL STUDENTS

Comparative Economics Grade 12

Although most educators agree that the skills of critical thinking may be taught in any subject area, economics presents a unique opportunity for such emphasis. Economics as a science is neutral - like physics or chemistry. It is a method of analysis. Economics does not tell you what you should stand for or what you should oppose. It takes human nature as it is, much good in man, but also much orneriness and potential evil. To avoid confusion therefore, the dividing line between analysis and policy prescription must be kept clear. Value judgments should be recognized for what they are. The right to value judgments should also be appreciated but individual responsibility to examine and analyze should also be realized. Mere whims and emotional surges should be held up to a critical eye. Propaganda techniques should be studied so they may be recognized in many disguises. However, the problem is not one alone of permitting students to examine data on perplexing issues, classroom activity must also provide opportunities for the student to establish personally satisfying and socially acceptable values on the basis of which he may make judgments on the choices confronting him.

In applying guidelines in teaching economics, the steps suggested by the National Task Force on Economic Education offer a logical sequence for high school seniors and are presented in four stages:

1. Definition of the problem. What are the facts? What issues are raised? Where are we in relation to where we want to go?

2. Identification of goals or objectives and assigning them some rough order of priority. This is an important step because goals, both personal and social, must be appreciated if logical procedure is to be assured. Not all people choose goals on economic reasoning alone but rather on basic belief that cannot always be disproved by logic or an appeal to the facts. Students should perceive differences in goals in our society and develop an ability to weigh and rank them in importance if the next step is to be fruitful.

3. Search for the principal alternative ways of attaining the objective - given the limited resources available to us and other restrictions that may be placed on our freedom of action. This gives us the alternatives from which we must make a choice.

4. Analysis of consequences of choosing each possible line of action. The course of action which contributes most to our most important goals is clearly the "best" answer.[34]

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[34] National Task Force on Economic Education. Economic Education in the Schools, (New York: Committee for Economic Development, 1961), p. 15.

If the course is started with a broad definition of economics as a disciplinary field and students are introduced to these problem solving techniques at the outset, the teacher enlists the help of the class as navigators. Once high school seniors appreciate the goals of instruction they derive great satisfaction from pointing out and focusing on any possible deviations from the line of attack -- not only with their peer group but with the teacher. Objectivity and rational analysis then become a shared goal. The teacher's prime function will be to avoid unbalance conclusions.

Seniors in high school at the outset of the course can apply these principles immediately to their own situation as they survey their future as productive citizens. As the course progresses problem areas would increase in scope and difficulty as other economic concepts are learned. One dividend for the teacher in concentrating on such techniques is the potential for coping with students of varying abilities. Every student can analyze some problems. While the average and above may delve into problems of deficit financing, economic growth, Federal Reserve regulations, balance of payments, capital investment, labor management relations, the role of the government in the economic system, forces acting on the value of money, conflicting ideologies, etc.; the slower students may experience similar stimulation in problem areas of G.N.P., automation, the middlemen, consumer credit, insurance, fringe benefits, productivity, tariffs, unions, and underdeveloped nations.

Not all students will develop the same measure of skill but all should grow in awareness of the necessity for and procedure for rational choices. Since I.Q. is not the passport to the ballot box and the market place, every vote counts as one, and every citizen must be his own analyst for his own good and that of society.

## CURRENT ECONOMIC PROBLEMS AND ALTERNATIVE SOLUTIONS

Economics Grade 12

In analyzing contemporary economics problems, we begin by asking students to identify what they feel are current economic problems. After compiling a list of suggested areas, we formulate criteria for evaluating whether or not they are really economic problems, rather than political or social. As we develop our criteria, we sharpen the focus of our thinking. When the criterion is developed, we apply it to each problem, discarding the non-economic in nature through collective analysis hinging on our criteria.

The next step is to determine the importance of the various problem areas, and we rank them as to their importance based on the criteria of general economic interest and self interest.

At this point, we take up the problem ranked number one. Our first step is to try to isolate the factors which indicate that it is a problem. In this step we review current articles, economic studies and newspaper articles to find evidence that a problem exists. We then undertake the crucial step of finding the causal factors. We begin by asking each student to think about the problem, as we have found it, and then to come to class prepared to discuss his views on the factors that have caused the problem. After these are presented, we discuss the tests of causal reasoning; such as, direct unbroken line between cause and effect, no other effect, no other apparent cause, etc., to validate our causes.

The next step, after isolating the causes, is to analyze the component parts of policy or decision making; e.g., establishing goals and objectives, deciding on means to reach the goals, and evaluating the effectiveness of our means.

Having done this, we begin to formulate goals to be decided upon in this problem area. We break down into buzz groups, and each group comes up with goals of policy in the area under consideration. We then meet in our large group to consider the committee reports and adopt our goals.

The next step, of selecting means, leads us to an initial discussion of the tests of validity of evidence and sources. We make a list of points to be considered in valid sources, e.g., recency, authority or knowledge of author, bias, etc. Then we discuss the validity of sampling, testing, surveys, statistics and other forms of evidence.

At this point, the search for means to achieve our objectives begins in earnest. As we search for means, we evaluate their validity by using our tests of sources and evidence.

When we have alternative solutions which have validity, we begin the final step and that is evaluating the probability of effectivenss of each of the alternatives. If the solution has been tried elsewhere, we examine the results; if it has not, we carefully review valid, expert testimony as to its probability of success.

Just before the conclusion of this study, we break down again into our small groups and each goes through the democratic decision-making process and adopts a method for solution.

Finally, the entire group returns to discuss the small group decisions. If they have chosen different alternatives, we engage in a thought-provoking period of probing the reasoning of each group and finally adopt a means of solution.

## CHAPTER 4

# SCIENCE

## STUDENTS RESPONSIBLE FOR SCIENCE CONTRACTS

Science

Grade 8

In teaching junior high science our textbooks utilize critical thinking which is basically the scientific method for solving a problem. The problem area sets up a series of questions to start the class to thinking. This is followed by information pertaining to the problem, research problems to be studied outside the classroom, and experiments to be performed during the class period. Time is set aside for the recording of all the information learned.

Another method used successfully in presenting a unit of work covering one grading period is a contract. A contract follows the material in the textbook setting up a series of problems with pertinent questions pertaining to each problem and the utilizing of outside references and research as listed in the contract. This contract is placed in the hands of each student in the class, and they are responsible for completing all the material within a six-weeks period. The student must make decisions and take the responsibility of budgeting his time and deciding how much extra material and problems can be carried out for the highest grade. A test covering the contract is taken, and if all the problems are solved correctly and the contract is complete, the highest grade is given.

The problems created by the contract must be worked out by the student in his own time and manner.

## A DIRECT APPROACH TO TEACHING THE SCIENTIFIC METHOD

Science

Grades 7 - 8

1. Characteristics of one who habitually and effectively uses the scientific method:

   a. Shows discrimination in selecting and defining significant problems.

   b. Show discrimination and skill in formulating hypotheses.

   c. Is adept in using experiments to test hypotheses:

      (1) Is critical of each step.

      (2) Sees alternatives to conclusions.

   d. Is versatile and critical-minded in using past experiences and authoritative sources such as books and experts in testing hypotheses.

   e. Is objective in the rejection, modification or acceptance of hypotheses as conclusions.

   - e. Is objective in the rejection, modification or acceptance of hypotheses as conclusions.
   - f. Recognizes the assumptions that underlie conclusions.
   - g. Has skill in selecting and defining new and significant problems, "next steps".

2. A pattern which can be used in extending the scientific approach to the everyday experiences of the child:
   - a. Demonstration experiment.
   - b. Statement of familiar instances of phenomena demonstrated.
   - c. Questions on what happened in the demonstration.
   - d. Question asking for the statement of hypotheses to explain what happened.
   - e. Statement of facts related to demonstration with question asking students to relate these facts to demonstration.
   - f. Acceptance of a hypothesis as a conclusion, or modification of it to form a more adequate conclusion.
   - g. Use of above conclusion in formulating a behavior conclusion.
   - h. Recognition of assumptions that underlie the conclusion.
   - i. List new questions raised by the demonstration.

3. Illustrative demonstration on the effect of water on burning fats:
   - a. Demonstration
   - b. Recalling of related experiences:
     - (1) When cooking fried cakes or other things in deep fats the fat sometimes catches fire. These can be safely extinguished by smothering with a metal lid, wet towel, or something of the kind. When water is added to a kettle of burning fat serious burns or fires usually result.
     - (2) Carbon tetrachloride or extinguishers containing liquid carbon dioxide are recommended for fat and oil fires.
     - (3) When making French fried potatoes, bubbles occur when the wet potatoes are dipped into the hot fat. If too many are dipped at one time the fat boils over.
   - c. What effect did the water have on the fire?
     - (1) What was the condition of the fat?
     - (2) Was much water used?

d. Formulate hypotheses to explain what happened.

e. Use the following facts in accounting for what happened:

  (1) Water is heavier than fats.

  (2) The temperature of burning fat is above 212 Fahrenheit.

  (3) Water boils at 212 Fahrenheit.

  (4) Burning occurs where fat and oxygen come in contact.

  (5) It takes many calories of heat to boil water.

  (6) Liquid water expands about 1600 times when it changes to a vapor.

f. Check your hypotheses with your own past experiences; and with authoritarian sources such as facts arrived at by experts. State the hypothesis which meets all of these criteria as a conclusion.

g. Draw a conclusion concerning the use of water to extinguish oil and fat fires.

h. List the assumptions you make in drawing this conclusion about the use of water to extinguish oil and fat fires.

  (1)

  (2)

  (3)

  (4)

i. State new questions that come to you becuase of this experience:

  (1)

  (2)

  (3)

  (4)

## DESCRIPTION OF A TECHNIQUE, PRACTICE, PROCEDURE, OR METHOD THAT I USE TO TEACH CRITICAL THINKING OR PROBLEM SOLVING

Science　　　　Grades 7 - 8

### SUSPENSE TECHNIQUE IN SCIENCE EXPERIMENT

In science, I try to induce critical thinking by arousing a student's curiosity about an experiment. This is very effective in starting a new unit or a new topic of discussion.

Once, I placed a raw egg inside a beaker full of vinegar. When the students entered the classroom, the questions began. They asked each other what the experiment was about,whether the egg was raw or hard-boiled, etc. They were actually seeking or collecting information about the problem.

Many hypotheses followed as to what was going to happen. Since no one knew what was going to happen, no one knew whose guesses were sensible and whose were not.

They watched the experiment as it slowly progressed and they constantly sought information. The class was dismissed and the students continued to talk about the experiment. Results could not be seen until the next day. The egg was greatly enlarged and appeared rubbery; the shell had disappeared; and the vinegar was very foamy.

The students came to many conclusions in order to prove or disprove their hypotheses. We then discussed the experiment in class.

### WHEN IS A PLANT NOT A PLANT?

Science　　　　Grade 8

Science has many opportunities to incorporate critical thinking. The following is a technique I learned from another science teacher:

An ordinary, artifical plant in a pot is used as the center of discussion. The question asked is, "What properties can you conclude about this demonstration piece?" The usual answers are involved with the potted piece being a plant, being green, having roots, using carbon dioxide, needing sunlight, etc.

Then the students are asked to prove their guesses. They usually conclude that they made certain unwarrented assumptions about the demonstration piece simply on its appearance - not any facts. The artifical plant was plastic and had no root system,etc., at all. What they concluded was previously learned material and not based on observation.

Science

Grade 6 - 8

After some three years of basic research and practice with the art of Inquiry Training, Dr. J. Richard Suchman, director of the Illinois Studies in Inquiry Training, conducted a workshop to train teachers and specialists in this art. Following the workshop, each participant taught an experimental (Inquiry) class as well as a control class which used the same films, but in which the contents were taught with conventional methods. Although the initial training involved the use of only sixth grade children, I chose also to work with eighth grade children.

Inquiry Training is a method of teaching the skills and strategies of scientific inquiry. The pupils are presented concrete physics problems via motion picture films. They observe the physical phenomena for which they must find appropriate explanations in terms of the physical principles involved. The students learn to formulate their explanations inductively by gathering data from which they make inferences and generalizations.

This is done by asking the teacher "yes and no" questions. The children may not depend on the teacher to give them explanations, interpretations, or principles. They formulate these on their own and test their validity through experiments of their own design. These experiments are structured verbally by changing one of the variables, and the "yes or no" informs the children whether their predictions are correct or not.

Following the taped session, the tape is played back to the group. The teacher stops the tape after each question and discusses the question's strengths and weaknesses.

The critique, then, serves to make the children aware of the process of inquiry and to help guide them in their investigation.

In comparing the data gathered on the experimental and control classes the workshop concluded that the experimental classes did not gain appreciably in subject matter gained, but that the experimental classes verbalize much more and were much more precise in the type questions asked.

## HOW CAN THE SPEED OF LIGHT BE MEASURED?

Science

Grade 8

Critical thinking can often be advanced in children by giving them a set of apparently unrelated data and letting them organize it in such a manner that an important truth or conclusion can be uncovered. Critical thinking is often only the optimum interpretation of existing facts.

In particular, the data used by Olaus Roemer in determing a finite speed of light is of excellent value in studying a unit on the solar system. At the beginning only the following information is revealed:

1. The distance from the earth to the sun is well-known.
2. The moons of Jupiter have regular and predictable periods revolution.

The pupils, then, are asked to develop a method by which the speed of light can be measured. All of their ideas are recorded, analyzed and evaluated. The teacher adds structure to the problem only when the pupils are badly misguided. Often three periods are spent on this problem. After much work has been done, a key idea will immediately reveal a complete solution to many of the pupils. Enthusiasm is at its highest as these pupils explain the solution to their classmates. The problem is concluded by the teacher explaining that this discovery ranks among the ten greatest achievements of science.

In each unit of study, an attempt is made to present such a problem.

## STUDENT SELF EVALUATION

Science and Arithmetic Grade 8

(Science) The difference between a good student and one who does poorly in many classroom situations is usally found in the individual's critical evaluation of himself in that situation. The poor student makes snap decisions based on false assumptions; the good student considers all or many of the factors and makes his decision as to the best adjustment.

My science classes practice the latter process daily and weekly in self-evaluation using the following form as a guide.

(Self-Evaluation Guide Sheet for Science)

Daily:

1. Initiative (Use of time)
2. Industry (Concentration, speed, accuracy)
3. Organizing, planning, goal setting (Attention to weak and strong points)
4. Results:
    a. Information acquired
    b. Changes in attitudes and/or actions
    c. Skills acquired or improved
    d. Ability to USE or apply to your daily life situations

Weekly:

Considering the time, ____________________, I have had available to use this week; I evaluate my achievement as ____________________________________.

I substantiate this with the following evidence:

a. I feel I have learned reasonably well ______list important laws______, etc.

b. A list of the specific changes in my attitude.

c. A list of the specific changes in my behavior or actions, those things I feel I had to do because of what I learned.

d. I have improved in these skills:

e. I have acquired new skills and am now able to ______________

f. I have applied these concepts to my own life in the following ways:

g. I have produced these tangible results:

   1. Evaluation of notes taken and their use.

   2. Diagrams, drawings, charts, etc.

   3. Themes, composition, creative effort, etc.

   4. Experiments conducted.

## PROVIDE PRACTICE IN PROBLEM-SOLVING TECHNIQUES

General Science

Grade 9

### 1. Suggesting hypotheses and procedures

It is very often possible, and evidently desirable, for pupils to suggest answers to a problem (hypotheses) and to evolve procedures by which these hypotheses may be tested. For example, in the study of the electromagnet, the teacher may first demonstrate the basic principle involved, and then ask the class to suggest ways of increasing the strength of the electromagnet and plan the experimental procedures required for finding the answer to the problem.

### 2. Drawing conclusions

When an experiment or demonstration is designed to present a scientific principle, law or relationship (as opposed to mere illustration or application,) then it will have largely failed in its purpose if the observer cannot or is not permitted to deduce the intended learning. Too often the teacher will perform a series of demonstrations and then vitiate the entire lesson by stating the conclusion for the class.

A tabular summary of the observed data is useful in helping to observe relationships and make conclusions. This applies particularly to the experiments or demonstrations which involve a series of tests or measurements, such as Archimedes' principle, the study of the inclined plane, or establishing a test for a nutrient. The experienced teacher knows that the arrangment and clarity of statements and tables placed on the chalkboard or in the pupils' notebooks are of considerable importance in teaching children how to make correct conclusions from the observed data.

### 3. Verifying tentative conclusions

In the study of Archimedes' principle, the class learns that the buoyancy of an object equals the weight of the water displaced. By observing that in any floating object the forces of gravity and buoyancy are equal, the class can be led to the tentative conclusion that a floating object displaces its own weight. This conclusion can then be tested by experiment.

### 4. Learning the use of a control

Students should learn early in their work in General Science that an experiment is not well designed unless all the factors which can affect the outcome are identical, except for the single factor under test. Only in this way can accurate cause and effect relationships be established. Demonstrations such as determining the per cent of oxygen in the air by the slow oxidation of iron, the test for Vitamin C, the digestion of starch, etc. require the establishment and identification of controls, and are useful in teaching this important tenet of experimentation.

## USING PROBLEM SOLVING SKILLS IN A GENERAL SCIENCE EXPERIENCE

General Science Grade 9

### 1. Sensing and defining a problem

a. Assumptions - The student has seen the demonstration concerning the use of orangeade deeply colored with grenadine. He has come to the appreciation that we should get evidence from as many senses as can contribute to a conclusion. He is familiar with the fact that touch is a sense, and that the skin is a sense organ.

b. Experience (Setting a Background) - Pair the pupils, and number the individuals in each pair. Ask each of the odd numbered pupils in the pair to cross the middle finger and the index finger of one hand, and keep his eyes closed until the demonstration is over. Give each even numbered individual a small bean. Instruct the odd numbered pupil to roll (with his crossed fingers) the bean which is in the palm of the even numbered pupil. Have each of these pupils describe the sensation.

Elicit from the pupils key words which were used in the descriptions. They may include words such as skin, touch, sense, sensation, accurate or variations of these words. List these words. Now ask the pupils to write three questions using each key word (or combination) that they would be interested in answering. However, each key word must be used in a question that begins with what, how, or why. Further state that the questions should come out of the experience they had with the bean and crossed fingers. Some questions might be:

(1) What makes the skin sensitive?

(2) Why does the skin fool us?

(3) How does sensation happen?

Sample the student questions orally and direct and refine the questions in a conscious effort so that it reads, "What part of the skin is most accurate?" Or select a phrasing that you think you can work with.

2. Designing an experiment

Focus the attention of the children on the important ideas connected with the problem. For example, they will have to direct their attention to the skin. They will have to deal with some kind of objects which will touch the skin. They will have to find out how well the skin can pick up the number of objects touching it. Now ask the students to discuss through socialized recitation procedure how they can design an experiment which will give them the facts they need for answering the problem. Gradually lead them into the procedure outlined in the experiment on skin sensitivity.

3. Organizing evidence on the problem

Show pupils height, weight charts. Elicit reasons why this procedure is better than a word description. Elicit from the students a method of recording the data they will obtain from their experiment. Lead to optimum description.

4. Interpreting the evidence obtained

Refer to the ways that children use to find out which movie is most popular. Refer to this figure as a measure of "central tendency." Now elicit how the data found in the experiment can be used to determine the most accurate area of the skin. During this process, some students may have to recheck their data for possible errors.

5. Elicit from the pupils the conclusions to be obtained from the data. Determine how we may be certain that these results are accurate and not accidental. What kind of control did we build into the experiment?

## ENCOURAGING INDIVIDUAL EXPERIMENTATION BY PUPILS

General Science Grade 9

Very often a demonstration which is performed by the teacher can be duplicated by the pupils at home or in the classroom. This is particularly true of those procedures which do not require special or complicated apparatus. Thus, children can perform procedures which show that air exerts pressure, that the pressure of water varies with depth, and that the pitch of sound produced by a vibrating column of air depends on its length; they can devise simple circuits, verify the Law of Reflection, etc. When sufficient apparatus is available or can be improvised it is desirable to have every child perform the experiment, and so gain valuable manipulative and problem-solving skills. Sometimes a table in a corner of the science room can be equipped with necessary materials, and individuals or small groups permitted to experiment at that table. Teachers may also assign as homework the performance of certain demonstrations and encourage the pupils to try variations, modifications, and individual experiments, provided they are made aware of the possible safety hazards and instructed in safe procedures.

## USING THE SCHOOL FOREST

Botany Grades 10 - 12

Our botany class is fortunate to have a fine forest on the school grounds. Each fall the tree leaves in the forest turn beautiful autumn colors. However, this change does not necessarily take place at the same time.

Our botany class visits this forest for various reasons during the fall. As the occasion permits, I will find a time when there are two trees of the same species near one another, one in green foliage and one in autumn colored foliage. I will go out with students to these trees and have the students observe the trees.

Someone will always ask, "What makes the leaves turn from green to fall colors?" I will point out the difference between the foliage of the two trees and have each student take a leaf from each of the two trees.

Back in the classroom each student will fasten his leaves to the top of a piece of paper and form a circle for discussion. I will repeat the student's question, "What makes the leaves turn from green to fall colors?" With the leaves in front of them, students will write out their ideas on the same paper.

Next, students in an informal discussion type environment will put forth their ideas or theories on the subject orally. Some ideas will be good and some pretty far from the truth.

Next, students will be given time to do research on the subject and collect facts from reference books, etc. In time they come back into the group situation to discuss and organize their findings. From the facts gathered, students evaluate their original ideas which were written on paper and discard those that are disproved. New ideas are formulated.

Students next attempt to test theories through experiments and then evaluate and draw conclusions.

## A PHYSICS EXPERIMENT

Physics Grades 11 & 12

This example is a laboratory type of problem as presented in our lab manual and has the characteristics of problem solving that we look for in as many situations as possible throughout the course.

The students are given a situation involving a set of identical tin cans with a different size hole in the bottom and capable of being filled to various heights. The problem is to derive a relationship which enables one to predict the time for the water to run out for any size hole when filled to any given depth.

Once the variables are enumerated, data is collected and tabulated for known depths of water running out of cans of known hole sizes. Various plans for analyzing the data are considered, and finally, with teacher direction, it is decided that the graphical method may be the most fruitful. This calls for more information on graphical analysis and appropriate mathematical techniques and finally the selection of those graphs which, when used together, will give the student the proper relationship to be stated in equation form.

Once the solution is found, it is tested by substituting known data to see whether the resulting time for water to run from a certain can corresponds to measured time for that particular can. If so, it is retried on another set of data until he is sure he has found the proper solution.

## CONFRONTING STUDENTS WITH A PARADOX

Physical Science Grade 12

If critical thinking is to be promoted by the suspension of judgment in the solution of problems, the student must be confronted with a paradox in the form of a demonstration, experiment, or inquiry.

One paradoxical demonstration that may be used for physical science or chemistry classes is the following: carefully weigh 10 grams of steel wool on a platform balance. If the steel wool is then burned thoroughly and then put back on the balance, the students should observe that the wool has gained some weight in the burning process. Repeating the entire procedure using ten grams of ordinary paper clearly shows that paper loses weight during combustion.

At this point the students should be allowed to probe into the nature of burning by freely offering suggestions as possible solutions to this paradox. The next day some form of Lavoisier's experiment (possibly burning matches in a strong, tightly closed flask) will show no change of weight of the flask's contents, until air is allowed in through some type of valve.

Another method for allowing students to do some thinking on their own would be their development of an experimental procedure to verify some physical concept. To get the class started, the instructor might pass around two spheres, one wood and the other steel. The questions to be raised is: Which one will hit the ground first if they are dropped from the third floor of the school building? Any answers the students may give must be verified by experiment. The students are then challenged to devise a practical procedure to test their answers. Intellectual hurdles that the teacher may inject into the class discussion might be: (1) How can air resistance be controlled? (2) How can we be sure both spheres are released simultaneously? (3) Can we be sure that both hit the ground at the same time? Given enough time the students should be able to theorize a method, and then they should be given a chance to incorporate their ideas into a single classroom demonstration that can be observed by everyone.

## APPLYING PHYSICS PRINCIPLES TO PROBLEM SITUATIONS

Physics Grade 12

I have always insisted that my students in Physics must learn the basic laws and theories and be able to apply these principles to a problem situation they have never faced before.

As an example: We will study Archimedes' Principle. A body wholly or partially submerged in a fluid is buoyed up by the weight of the fluid displaced. After a thorough discussion of this principle, I will present several problems related to the textbook assigned exercises but different to such an extent that the student must think in a critical manner.

Example I. A platform scales is balanced with standard weights on the one platform and an empty oil can with the lid removed on the other platform. A housefly wings its way through the opening into the can and continues to fly around inside the container never touching the side or the bottom. Will the scales still balance. Explain:

I am more concerned with the explanation than I am the answer. The student is then encouraged to test his answer by an experiment in the laboratory.

Example II. A rubber balloon is weighted so it barely floats in water. If I push the balloon a short distance under the water and then release the downward force of my hand, what would probably happen? Explain why: You notice here that the student must first decide what he thinks should occur and then next must give the theory as to why such an occurence happened.

The traditional physics textbook gave the answer and said it sank. Then it asked the pupils to explain why. However, I don't believe this is thought provoking. The student next is encouraged to experiment with the balloon in the laboratory. Many of our textbooks following the traditional physics program have always given the laws and formulas for the student and then 10 to 20 similar problems to drill the students. This to me does not teach critical thinking. Almost any student of this caliber can do 100 similar problems after the formulas and examples are given. One must be sure to teach the basic theories and laws and then give problems that are different from the regular textbook exercises to see whether the student can carry the theory into practice. The P.S.S.C. physics textbook committee has recognized this need and has been very careful to stress this type of problem solving in the new physics. We must be careful however, not to throw the baby out with the bath water. We could end up with too much theory, and I believe, a decided drop in interest on the part of the majority of high school physics students.

## TEACHING STUDENTS TO QUESTION WHY

Physics Grade 12

A teacher of science is in a position to do much to develop critical thinking among his students because critical thinking is a part of all scientific effort. A science teacher has at his command a variety of devices, including the scientific method, to stimulate and increase quality critical thinking.

In my classroom, I like frequently to make a statement within which there is an error. I can spot at once the difference between the nodding, agreeing non-thinker and the student whose face looks puzzled and whose hand rises to challenge my words. Soon the habit of critically examining my statements is developed in many students.

I try not to consider any material covered in my class too simple or complex for the question "Why?" Students soon brace themselves for this inevitable question, and undergo the thinking process necessary to arrive at an acceptable answer, if there is one.

In laboratory work, I try to emphasize the idea for original research. I find improved results and more original thinking in student laboratory reports when I create a sense of urgency and pressure about the experiment. When results go astray from accepted values and expected conclusions, I welcome this as an opportunity for critical thinking students to determine what variations in procedure caused the unexpected result.

Requiring book and periodical reading reports exposes my students in science to the experimental and theoretical accomplishments of great men in science who obviously had developed the skill to think critically.

In nearly all classroom associations with my students I allow myself only to assist the student in finding an answer to questions about science not answer them for him.

It is my hope that the student with increased ability to think critically can apply the methods of science to both scientific and non-scientific situations and recognize the limitations of such in areas apart from science.

## SUGGESTIONS FOR STARTING PROCESS TEACHING IN SCIENCE[35]

Process teaching in science is not new. It is essentially a matter of placing emphasis on such processes of inquiry as problem recognition and definition; observation; the collection, analysis, and interpretation of data; hypothesizing; generalizing; and others. However, many science teachers need help in developing the proper classroom lesson format to produce effective results.

Following are some learning situations selected from general science, biology, chemistry, and physics which follow a problem solving or inductive approach. A teacher desiring greater returns from his teaching may use a few such activities through the year.

LEARNING SITUATION 1. The Siphon. (General Science)

1. Silent demonstration of siphon using colored water. A siphon can be made from two pieces of glass tubing, each about 8 to 10 inches long, connected by a rubber tube of the same length. Fill two milk bottles each about half full of water. Fill the siphon tube with water and pinch tightly at the rubber connection. Now place one end of the siphon in each of the bottles. Hold a bottle in each hand and manipulate one end of the siphon up and down.

2. Do you recognize a problem here?

3. How would you state the problem?

    a. What makes the liquid move?

    b. What causes the liquid to flow?

    c. Under what consideration does the water in the siphon flow?

    d. What factors influence the flow of a siphon?

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[35] Elsworth S. Obourn, Aids for Teaching Science, (U.S. Department of Health, Education, and Welfare Bulletin, April 1963), pp. 1 - 2.

4. Propose hypotheses for phenomena observed.

5. Suggest controlled experiments by means of which the hypotheses can be tested.

LEARNING SITUATION 2 Conditions Essential for Burning. (General Science, biology, chemistry, and physical science)

1. Demonstration or laboratory experiment. Heat a piece of charcoal and a piece of asbestos of like size over a Bunsen flame. Heat one piece of charcoal in a covered crucible and a piece of similar size on an open asbestos mat. Place bits of paper, wood, charcoal, sulfur, or coke on a piece of sheet iron or copper and heat from below with a Bunsen flame.

a. Statement of problem

b. Proposing hypotheses

c. Identification of assumptions

d. Suggesting controlled experiment to test hypotheses

e. Performing experiments

f. Evaluating evidence

g. Drawing inferences

h. Final test of inferences

i. Drawing conclusions

LEARNING SITUATION 3 The Candle and Jar. (General science, biology, and physical science)

1. Silent demonstration. Fasten candles of different sizes to the bottom of the suitable pie tins with melted wax. The aluminum foil pans used for certain frozen foods work very well. After the candle has been lit with a match, cover with a jar. Try the following jar and candle combinations. Make careful observations. Repeat for accuracy. See if you can get measurements of any factors.

a. Long thin candle--large jar

b. Large diameter candle--large jar

c. Large diameter candle--small jar

d. Birthday candle--small jar

e. Birthday candle--large jar

f. Other variations

2. Discussion of observations (record on blackboard)

3. Testing various hypotheses.

4. Select most promising hypotheses.

5. Evaluation of evidence.

6. Interpretation of evidence.

7. Drawing generalizations.

LEARNING SITUATION 4 The Pendulum (General science, physics, and physical science)

1. Demonstration of pendulums of many types. From a suitable support set up pendulums of a wide variety as suggested below. Determine the period of each pendulum by timing fifty swings and dividing the total time by fifty. Start the pendulum swinging. As it crosses the midpoint of its swing (place a chalk mark on the floor) start timing and counting zero - one - two - three - etc., to fifty.

  a. Long--short cords--same type bob

  b. Bobs of large and small mass

  c. Compound and simple bobs

  d. Use bobs of many different sizes

  e. Use bobs of like weight but different size

  f. Other variations

2. Definition of problem. What factors affect the time of vibration (period) of a pendulum?

3. Suggested factors (hypotheses). How do they affect the period of the pendulum?

4. Design of controlled experiments.

5. Quantification of evidence by timing as suggested above.

6. Evaluation of evidence.

7. Interpretation of evidence.

8. Drawing inferences.

9. Further test of inferences.

10. Drawing conclusions.

## SCIENCE PROBLEMS WHICH MAY BE USED AS LEARNING SITUATIONS[36]

The following learning situations or problems have been selected from all areas of high school science. Some are commonplace and may be found in the traditional high school science courses. Others are a bit more sophisticated and may call for more ingenuity on the part of teacher and pupils.

The list of problems is only suggestive. The resourceful and creative teacher will find many other of the commonplace everyday science topics which by a slightly different approach or a twist into a question may prove to be a provocative and rewarding learning experience.

1. What are the products of burning?
2. Under what conditions do liquids transmit pressure?
3. What are the factors which influence the pressure beneath the surface of a liquid?
4. What facotrs influence the size, shape, and nature of the image formed by a concave mirror?
5. Under what conditions is heat energy transmitted?
6. How does the volume of a confined gas vary with change of pressure when the temperature is constant?
7. How do detergents affect surface tension?
8. Under what conditions do liquids pass through semipermeable membranes?
9. What factors influence the rate of flow of liquids through semipermeable membranes?
10. Is osmosis a one-way flow through semipermeable membranes?
11. Do plants grow at different rates in light of different wave lengths?
12. Do ice crystals forming in water "capture" dissolved salts?
13. What factors affect the rate of migration of ions in a chemical solution?
14. Do pollen grains which have absorbed an isotope transfer radioactivity to a plant embryo?
15. Can wooden blocks impregnated with iodine be used as controls or to provide additional data when demonstrating the coefficient of friction?

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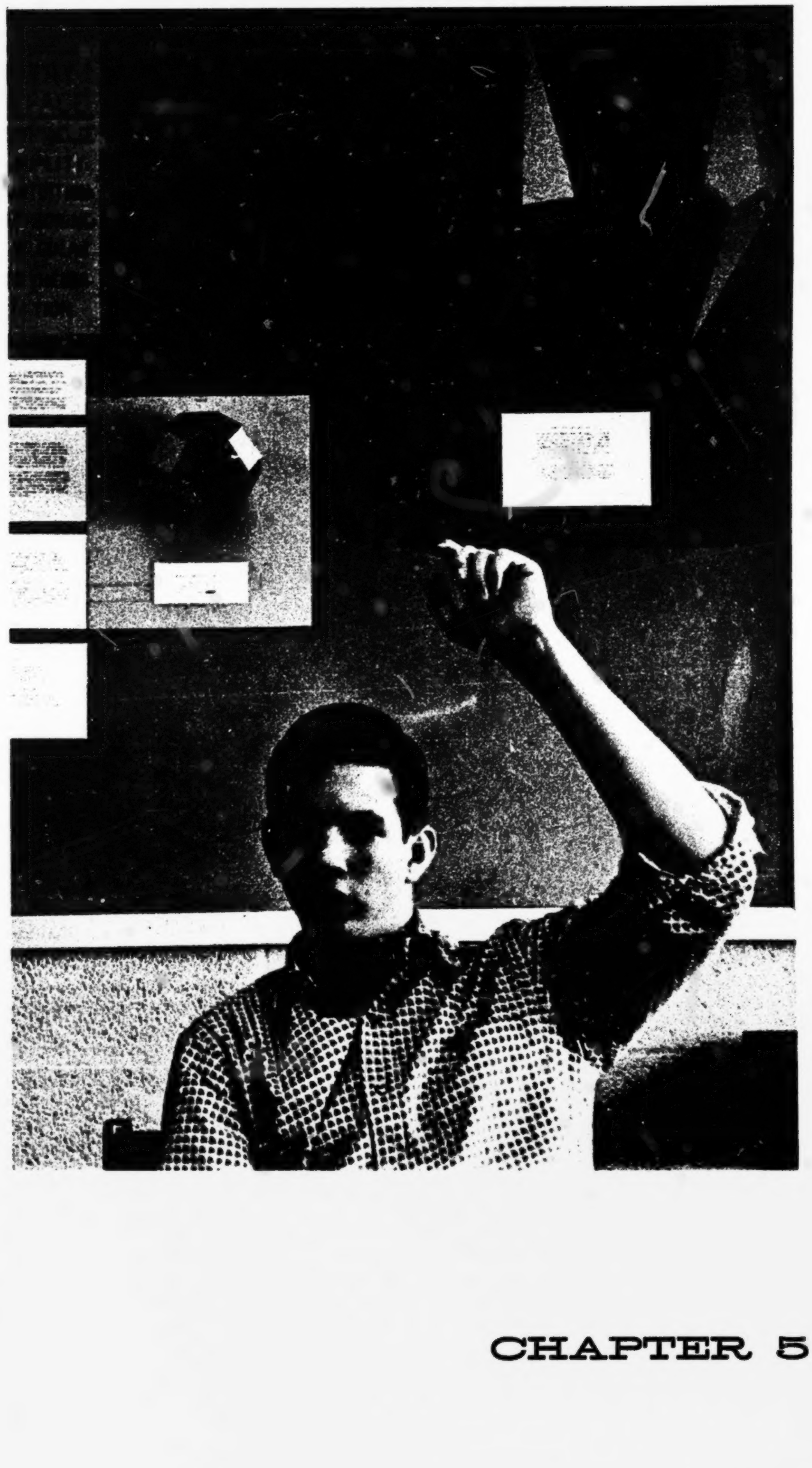
[36] _Ibid._, pp. 14-15.

16. Is heat energy produced where iron rusts?
17. How does colchicine affect the growth of plants?
18. Are the claims made for commerical fertilizers valid?
19. Does pasteurization affect the rate at which milk sours?
20. Is there a relationship between the size of seed and the size of seedling in a given plant species?



## CHAPTER 5

# MATHEMATICS

## FINDING THE LEAST COMMON DENOMINATOR

Mathematics Grades 7 - 8

When there is a problem to be solved, I attempt not only to have the problem solved, but to have it solved in a manner that can be used in other problems of the same type.

I attempt to have the students think through the solution and see for themselves that the method will work at all times.

For example, in finding the least common denominator of a group of fractions, students will find some problems in which visual inspection will suffice in finding the common denominator, or others in which some methods will lead to a common denominator but not the least common denominator, thus causing extra work.

I put a problem on the board and ask the students to look at the denominators thought of as a product of factors. I use one or two denominators that have factors which are easily seen (12, 6) and one prime number (5, 7). This causes the student to think about the 5 and 7 being a product of factors.

After it has been determined that the answer to the questions is true, I ask for the factors of the denominators. Having received these, I ask the students if two products are equal, is the product of their factors equal? I will get yes answers without much trouble. I then proceed to the board and write the following: (12 = 6x2) (12 = 4x3) and then ask what is wrong. The answer is much slower than before in coming. The fact that the prime factors must be the same comes to light.

Now we go back to the denominators of the sample problem and I ask, "How can we make these denominators have the same factors?"

There is a pause and sometimes they do not come up with the answer, and I must say "What factors does this denominator have that that one does not?" With this the hands go up, and we make progress toward the solution of the problem. The students now have an understanding, or are starting to, of how we arrive at common denominators by using a method that will work anytime. Also many concepts and terms are reviewed to bring them closer to being fixed ideas in their minds.

## STUDENTS ANSWER THEIR MATH QUESTIONS

Mathematics Grade 7

Critical thinking may be evidenced by the kinds of questions pupils ask.

A seventh grade class had been studying problems of finding the area and perimeter of a parallelogram. One pupil asked if rectangles of equal area necessarily were of equal perimeter. The class reflected and another pupil said that he could take a piece of string, tie the ends together, and form a variety of rectangles with clearly the same perimeter and different areas. Another suggested sliding one base of a parallelogram off to the right as if it were on a fixed track. He pointed out that the areas of the parallelogram thus formed are all the same, but the perimeters are not.

## Math Formula Discovered Through Trial and Error

A seventh grade class had discussed short methods for finding the sum of an arithmetic series as part of an assignment in Chapter 1 of S.M.S.G., *Mathematics for Junior High School - Volume* 1. The teacher then led his class to a discovery of a short method for finding the sum of a geometric series.

Several attempts based on Gauss's method for finding the sum of an arithmetic series were suggested by pupils. The teacher had the following series on the chalkboard:

a. $1 + 2 + 4 + 8 + 16$

b. $10 + 20 + 40 + 80 + 160$

c. $3 + 6 + 12 + 24$

A pupil suggested multiplying the last term by two and subtracting the first term. This worked on the three examples noted. However, when $1 + 3 + 9 + 27$ was tried, the method failed. Another pupil said to try multiplying by 3. This failed but a pupil noted the answer was twice as big as it should be. The pupils then said to try as a pattern multiplying the last term by the ratio and subtracting the first term. This was tried but produced a result which was twice as big as it should be when the ratio was 3. Then a boy said, "We didn't divide when the ratio was 2. We have to divide by 2 when the ratio is 3, do we have to divide by 3 when the ratio is 4?" This was tried and found to work. Several tried the pattern on a series with a ratio of 5. The pattern worked.

The problem then became one of generalizing the pattern to a formula. With the help of the teacher in getting the last term expressed as $ar^{n-1}$ and the first term as a, the formula for the sum of a geometric series, $S_n$ was developed.

$$S_n \qquad \frac{a(1 - r^n)}{1 - r}$$

Throughout this lesson pupils were doing much critical thinking. They were suggesting a hypothesis, techniques and methods, testing their hypothesis, rejecting those which were obviously incorrect, and refining others which seemed to have value.

## MATH STUDENTS HELP EACH OTHER IN GROUP SYSTEM

Mathematics Grade 8

In attempting to deal with the individual differences of my eighth grade pupils in mathematics I have been trying a form of group discussion.

In carrying out this method of group discussion, I first divide the class into groups of four or five members each. The students will then move their desks together in a circular arrangement and begin to discuss the material involved. I use this method for the most part, when we are covering the reading type of problem or thought problem. I give the correct answers for the problems to the pupils. In the majority of the cases, someone in the group has the wrong answer. It is at this point that the critical thinking should begin. I believe that the person with the correct answer is most happy to help the person who has failed to achieve the correct answer.

In order for one student to help another there will have to be critical thinking on the part of each pupil. The person doing the explaining will have to think critically of a plan by which he will explain the problem to the other pupil. The person to whom the problem is being explained will also have to think critically in order to understand the details given by the helper.

If, after this type of group discussion has taken place, there is anyone who is still having difficulties, I will help him with his problems.

I believe this method just described can be used in subjects other than mathematics. I used mathematics in the example because it is the subject in which I have used this method most.

## STIMULATING CURIOSITY IN MATH

Mathematics Grade 7 - 12

There seems to be commonly accepted ideas about a teacher's function in relation to the concepts of learning. The emphasis is on the learner, on his goals, needs and problems as a basis for learning, but some teachers see themselves as the only persons in the classroom capable of knowing and establishing the goals of instruction. Learning must begin from action, but some teachers see themselves as preventing action. The student behaves in a unique manner, but some teachers may consider it their job to dimish differences.

The point that I am trying to make here is: we as teachers assume all the responsibility of determining goals, evaluating achievement and controlling conduct. Since, without a doubt, these tasks are basic parts of the learning processes, such a teacher defeats the basic objectives of learning and critical thinking.

A teacher must take constructive action. He must arrange a stimulating environment for learning and critical thinking.

To be an effective teacher, he must be only a (1) participant in the group planning and evaluating, (2) a counselor or friend to each individual, (3) creator of environment for good learning, and (4) a spokesman who interprets the group processes.

Critical thinking is a part of the problem-solving concept. A problem does not exist for the learner until it is his problem, so the beginning of critical thinking commences when he recognizes and accepts this goal, the attainment of which will necessitate a conquest of certain obstacles. The teacher is in the position to guide, stimulate and encourage the learner in reaching this goal as well as showing the importance of transferring the learned knowledge to new problems.

A teacher must always strive to arouse interest and curiosity in the classroom as this will eventually lead to critical thinking. In mathematics classes, I am always striving to show some definite techniques and short-cuts that will be of tremendous help in stimulating critical thinking and make mathematics enjoyable rather than a chore.

Some examples are mental arithmetic for the last five minutes of a period daily, boys versus girls or chosen teams; crossword puzzles utilizing the fundamental processes; shortcuts such as when multiplying a number by 33 1/3, you can divide by 3 and multiply by 100.

Materials of this type arouse curiosity, the why's and if's of mathematics, leading to an extreme desire to learn other techniques that will make the subject more meaningful and interesting. A teacher must always be striving to create interest in mathematics because this is a subject in which critical thinking can be developed and eventually transferred to other subject areas.

## ORGANIZING THE CLASSROOM AS A LEARNING LABORATORY

Mathematics Grade 7 - 12

It is not enough to have pupils learn rules, and blindly follow these rules. There must be a proper balance between computational skills and understanding.

Children want to know and will be interested in experiments which will lead to cause and effect relationships - to answer the question of why and how. The classroom can be organized as a learning laboratory in which pupils discover, explore, and feel free to express themselves. Formulas and symbols from science make good mathematical problems. Pupils may be asked to bring in formulas from industry where the father is employed.

The teacher must provide experiences where the child is led to discover, largely through his own efforts, the principles and relationships rather than to be told. The laws for addition, subtraction, multiplication and division of signed numbers can be developed through many illustrations, number lines, graphical representation, and the use of film strips.

Diagrams and models which show relationships should be used whenever possible. Estimating answers in order to check on the reasonableness of answers should be used frequently. Skillful questioning may lead to a rule or generalization by the student. Graphing the solution set of equalities and inequalities will give practice in thinking mathematically. Pupils must be cautioned that a piling up up of cases does not constitute a realiable proof. An example of this is the measurement of the sum of the angles of a triangle.

## THINKING CRITICALLY ABOUT EQUATIONS

Algebra Grade 9

A general algebra class had concluded that $\frac{ha + b}{h} = a + b$. The class had canceled thus: $\frac{\cancel{h}a + b}{\cancel{h}}$. One lad questioned this equality, however, because he said that ah + b should equal the product of the two factors, h and a + b. The teacher suggested that they give the variables numberical values and see how this expression looked in arithmetic. They used this expression: $\frac{3\ (10) + 7}{3}$ or $\frac{37}{3}$. The class said $\frac{\cancel{3}\ (10) + 7}{\cancel{3}} = 17$ or $\frac{\cancel{3}7}{\cancel{3}}$. They knew that $\frac{37}{3} = 12\ 1/3$ and that $12\ 1/3 \times 3 = 37$. One girl said, "You can't divide just part of the number by 3. You must divide all of it by 3. Both terms must be divisible by 3." Then the class went back to the abstract form. They said

$$\frac{ha + b}{h} = \frac{\cancel{h}a}{\cancel{h}} + \frac{b}{h}$$

$$a + \frac{b}{h}$$

The class was puzzled by the abstract expression. They used a concrete example to analyze their error and then generalized the procedure to the abstract expression.

## TEACHING THINKING IN MODERN ALGEBRA

Algebra Grade 9

After studying the axioms and properties of numbers especially, the zero property (If "a" is any number, then $a + o = a$), critical thinkers may be stimulated by problems of this type:

When is $(6d + 5b = 6d + 4b$ or
$(4\ (a + b) = 4a + 3b$ or
$(c + d)\ 13\ 1/3 = 13\ 1/3\ c + 62.35\ d$

Usually before the period is over, or at least in several days, some of the students will say "It is true when b, br, d is equal to 0."

## THE SYLLOGISM

Geometry

Grade 10

The syllogism is the "heart" of geometry. Yet how little we see it emphasized. The syllogism is the tool by which deduction is carried out. A syllogism consists of three statements or parts as shown below.

| | |
|---|---|
| All birds have feathers | (major premise) |
| A robin is a bird | (minor premise) |
| $\therefore$ A robin has feathers | (conclusion) |

Once the major and minor premises are accepted one need not to argue for the conclusion -- the conclusion follows; the conclusion is a consequence. Students must feel this power.

It is interesting and profitable to the students to have them construct syllogisms which will argue certain conclusions. For example: to construct a syllogism which would argue that "there should be no quizzes" one could write:

Anything which tends to make students tense should be abolished
(Major premise)

Quizzes tend to make students tense, for
(Minor premise)

a)

b)

c) (Here the student is supporting one of his premises)

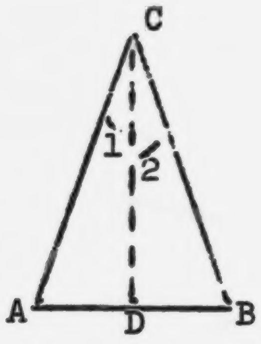
d)

Quizzes should be abolished. (Conclusion)

This gives a good setting for syllogisms in geometry.

The student should sense that the method of argument most used in geometry is syllogistic. It is good practice to ask the student to write simple proof in syllogistic style.

In example: The proof



**Given:** $AC \cong BC$
$\angle 1 \cong \angle 2$

**To Show:** $\triangle ADC \cong \triangle BDC$

**Deduction:** $AC \cong BC$
$\angle 1 \cong \angle 2$
$CD \cong CD$ (identical)

$\triangle ADC \cong \triangle BDC$ (SAS)

becomes

Any two triangles which have SAS = SAS are congruent
(Major premise)

Triangles ADC and BDC have SAS = SAS FOR

1) $AC \cong BC$

2) $\angle 1 = \angle 2$

3) $CD \cong CD$

$\therefore \triangle s$ ADC and BDC are congruent

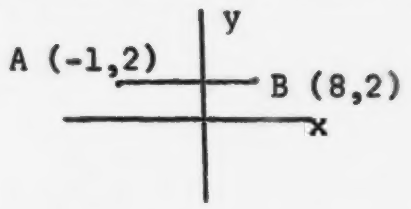
in syllogistic form.

The study of the syllogism immediately suggests a study of fallacies. Books on logic, argumentation, and debate help here. Fallacies such as reasoning in a circle, non - Sequitur, and others occur on students' geometry papers, and these provide an excellent departure point into the subject of fallacies in general.

## THINKING THROUGH LINE SEGMENTS

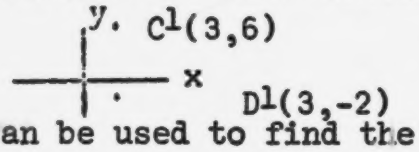
Geometry Grade 10

The coordinate geometry formula for finding the midpoint of a line segment can be developed heuristically. Beginning with previously learned notation and definitions, the pupil readily discovers how to measure horizontal and vertical line segments: (a) The distance between two points with the same ordinate value is the absolute value of the difference of their abscissas.



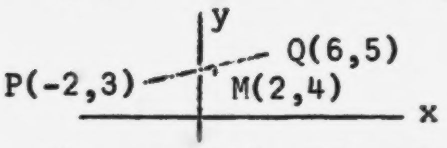
$\overline{AB} = [8 - (-1)] = 9$

(b) The distance between two points with the same abscissa value is the absolute value of the difference of their ordinates.

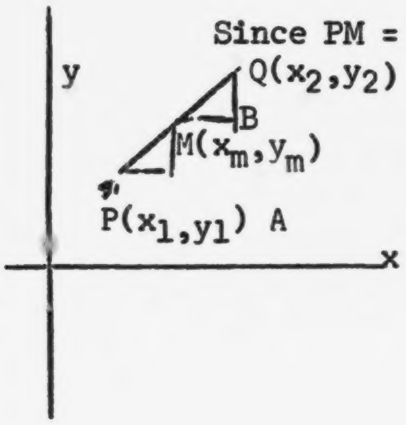


$\overline{CD} = [6 - (-2)] = 8$

This information can be used to find the coordinates of the midpoint of a given line segment. First, the pupil solves the problem of finding a specific midpoint by making estimates and checking them with the above statements. The midpoint of the line segment between P (-2,3) and Q (6,5) is M (2,4). In order to generalize this for all line segments, the pupil should verbalize how he thinks the coordinates are related: The abscissa of the midpoint of a line segment is half the sum of the ordinates of the end points.



To prove this for all line segments, the pupil needs to recall relationships to establish congruent triangles and facts about congruent triangles.



Since PM = MQ, MB || PA, then triangle PMA is congruent to triangle MQB.
Thus PM = MQ and also
PA = MB, and MA = QB

$$PA = [x_m - x_1] \qquad MA = [y_m - y_1]$$
$$MB = [x_2 - x_m] \qquad QB = [y_2 - y_m]$$

$$x_m - x_1 = x_2 - x_m \qquad y_m - y_1 = y_2 - y_m$$

$$2\,x_m = x_1 + x_2 \qquad 2\,y_m = y_1 + y_2$$
$$x_m = \frac{x_1 + x_2}{2} \qquad y_m = \frac{y_1 + y_2}{2}$$

## DISCOVERING RELATIONSHIPS THROUGH MATHEMATICS

Mathematics Grade 12

In the study of geometry there are innumerable opportunities for the learner to engage in critical thinking, if the teacher encourages and assists the pupils to discover planar and spacial relations and patterns.

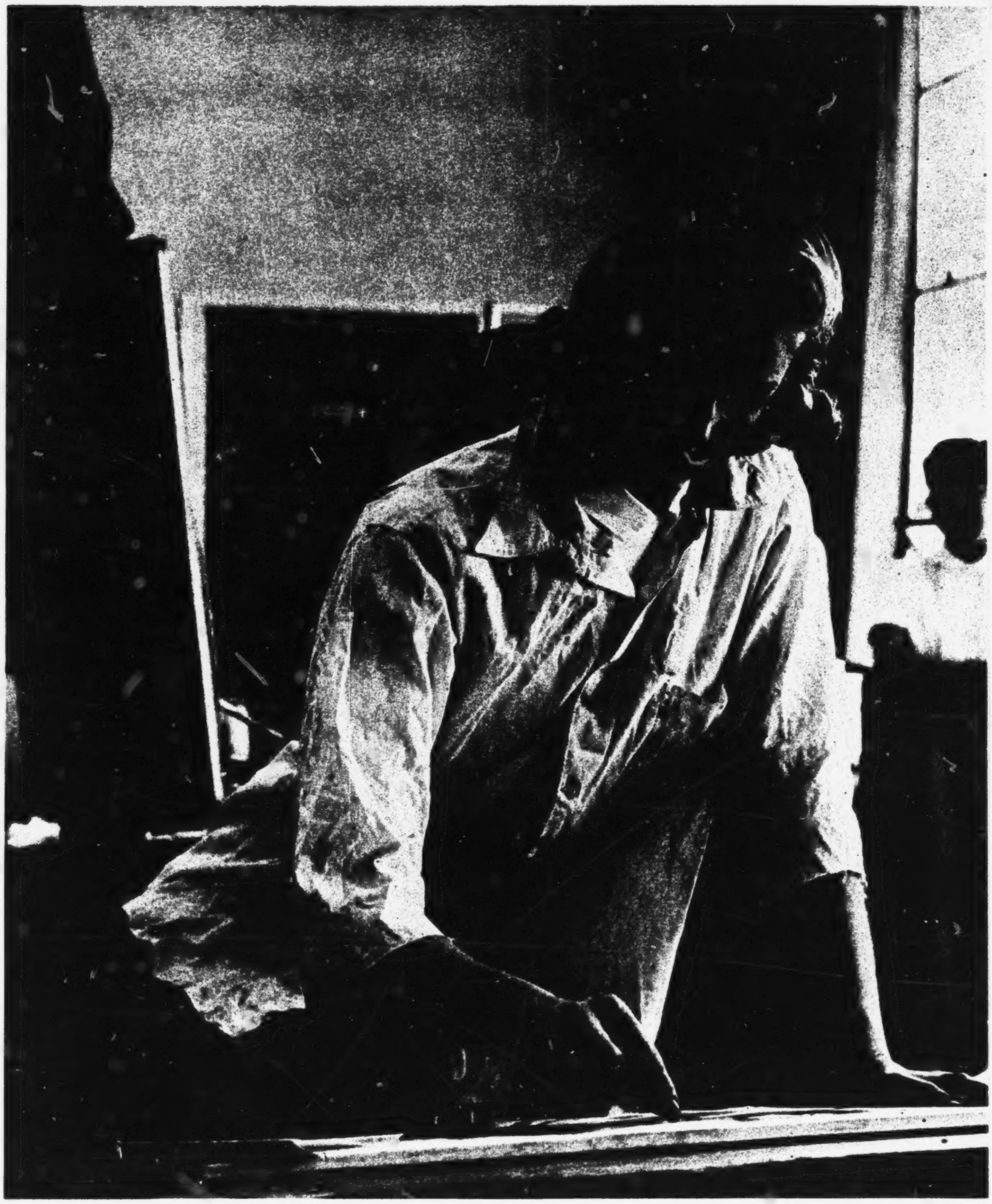
An example of this discovery which leads to critical thinking is:

You may assit the pupils to discover that the lateral edges and altitude of a pyramid are divided proportionally when this pyramid is cut by a plane parallel to the base. This accomplished, you may ask whether there seems to be a relation between the section and the base. Several pupils will observe that the base and section appear to be similar; follow this with "Can (we/you) prove it?" This leads to comparison of areas of these similar figures, then to the fact that the area of the section is to the area of the base as the square of the distance of the section from the vertex is to the square of the altitude of the pyramid.

From this, one can assist the pupils in discovering the relation of mathematics to physics. Replace the vertex of the pyramid with an electric light bulb, the edges of the pyramid become the light rays. Then the discovery that the intensity of light varies inversely with the square of the distance from the source. This is by way of research through school library and physics books.

Finally, the pupils are asked to justify this through the mathematics: in short, to discover the relation between the physics and the mathematics.

This method replaces that of memorizing the theorem from the text where no thinking takes place.



## CHAPTER 6

# THE ARTS

## FINDING SUBTLE MEANINGS IN ART

The Arts Elementary through Senior High

Learning to look at, to understand, and to appreciate a work of art involves critical thinking on the part of each individual. In our junior high school arts program there is a continuous emphasis placed on providing experiences with actual works of art or with good reproductions. The values as well as the limitations of reproductions are learned through experience. Sources of information are evaluated through conversations with resident artists, through studying the writing of artists, and through comparing a variety of points of view as expressed by critics. Whenever possible, works of art are presented on a comparative basis. The need to go far beyond a description of the obvious surface aspects of the work of art is quickly apparent. Through continued study, discussion, and reference to resource material each student begins to discover the more subtle meanings which are expressed through the art object. He finds that architecture and sculpture as well as painting are expressions of the artist's philosophy or of his attitude toward life. The following statement of a thirteen-year-old boy is a result of the type of critical thinking toward which we are working: "I think that the one painter (Constable, Salisbury Cathedral) felt that he had been given a life to live and that life could make of him what it wanted, but he could not change life. I think the other artist (Feinninger, The Church) felt just the opposite. Life had been given to him and he could manipulate it anyway he wished."

## WORK PLAN SHEET FOR ART STUDENTS

Visual Arts Elementary through Senior High

The visual arts are often thought of in terms of techniques or of "pure expression." Neither view clarifies adequately the role of art in the critical thinking or problem solving process.

Our approach from the early elementary grades through the high school is one of helping the learner to identify a problem he wishes to solve, to select the appropriate materials and processes, to develop the discipline and skill required to control the selected medium, and to realistically evaluate the entire process. The learner is thus provided with a rigorous problem-centered experience. Such an experience is the very essence of a good arts program.

Identification of an appropriate problem and the projection of steps for its solution are critical phases of the creative process. In University School we have found a Work Plan Sheet to be a useful device. The plan is initiated by the student, but the cooperative guidance of the teacher is involved throughout the entire process. In this way, evaluation becomes a continuous concern from the planning through the completion of a project. The deep personal involvement which is demanded in such an experience carries with it the responsibility for real critical thinking on the part of each individual.

## LEARNING TO DISTINGUISH QUALITY

Vocal Music Grades 9 - 12

Students are often told that their performance at grade school level is appreciated mostly for the future potential it holds and that a higher degree of quality is expected of high school students. A tape recorder of very high quality is used with student groups to point out and demonstrate the difference in sound between their own performance and that which they themselves would like to hear or would buy on a recording. Differences of very small magnitude are pointed out as being very serious. There are entire rehearsals devoted to study of technical points which never were discovered by most students prior to these sessions.

The esthetic side of performance is emphasized as the important part of the students' vocal music experiences. The learning experience of having students to sing sympathetically with an idea in the poetry reinforced by the mood of the song is probably as high an example of intellectual activity as may be experienced at high school level. Constant evaluation of musical interpretations accompanied by explanations of why they reinforce the poetic idea expressed, leads to critical thinking.

## TEACHING CRITICAL THINKING IN THE ELECTRICITY CLASS

Industrial Arts - Electricity Grades 10 - 11

In the electricity-electronics shop or laboratory, servicing the diverse products of the electrical industry provides challenging experiences for the students. Among the products that they service are radios, television sets, amplifiers, small motors, etc. Students are taught to recognize the problems and are encouraged to state their hypotheses and write up the symptoms of the product before making the necessary repairs.

Data and information dealing with servicing the product is available to the students in the form of technical charts, reference books, schematics drawings, technical data, mock-ups, wall charts, film strips, films, troubleshooting procedures, various types of test equipment, and other multisensory teaching aids.

While troubleshooting a radio receiver, they are taught to ask such questions as: What is wrong with this radio? What kind of a radio is it? Where should I start? What test equipment should I use? Why am I getting this sort of reading on the meter? If it is a tube, can I substitute another tube? What function does the burned out tube perform? What else is wrong with it? How about other components? Is it worth repairing or should it be replaced? How much will this cost?

After evaluating and reviewing the data and available information, a final judgment is made which is representative of the students' thinking and ideas.

Problem solving is a mental process and not manipulative; however, manual skills may serve as media for effecting solutions.

Industry today spends billions of dollars annually in research and development seeking new products, processes, materials, and methods.

The term "project" is a familiar one in industrial arts. A general objective of industrial arts is to provide a wide range of exploratory activities which will orient the pupil with industry, its products, occupations, processes, tools, materials, applications, experimentations, and a reflection of the technology and industry. If the subject matter is to reflect technology, then our industrial arts project must be designed by the pupils and should have technological and contemporary implications, as opposed to the traditional foot stool, tin cup, and broomstick holder projects.

To facilitate critical thinking dealing with the "project," the industrial arts laboratory must include technical data and information. Among the more popular aids are cutaways; mock-ups; demonstration boards; diagrams; models; charts; pictures; catalogs; opaque, overhead, sound and filmstrip projectors; reference books; reference charts; and other multisensory techniques.

The role of the teacher should be that of a resource person consulting with and directing his students engaged in problem solving experiments. The pupil must be given every opportunity to solve his own problems relating to planning, construction, and finishing of the project.

The industrial arts shop or laboratory must have an atmosphere of design, experiment, invention, research, and development. Basic industrial practices and scientific principles can be demonstrated, tested, and integrated together. Students' dreams, imaginations, visions can take form and become a reality in the industrial arts laboratory through their projects.

Technological advancements have been developed by men who have formulated a hypothesis and have projected their thoughts through the process of critical thinking.

# APPENDIX

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## C FILMS

Indiana University

THE MAN WHO KNOWS IT ALL

WORDS AND THINGS

WHAT IS A GOOD OBSERVER

STATEMENT OF FACT

PEOPLE UNDERSTANDING EACH OTHER

DEFINING DEMOCRACY

HOW EFFECTIVE IS YOUR READING

PROBLEM APPROACH TO LEARNING., McGraw-Hill

## D TAPE

Illinois Curriculum Project. Everybody's Mountain. University of Illinois.

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